

$B_s^0$ 

$$I(J^P) = 0(0^-)$$

*I, J, P* need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S086

NODE=S086

NODE=S086M

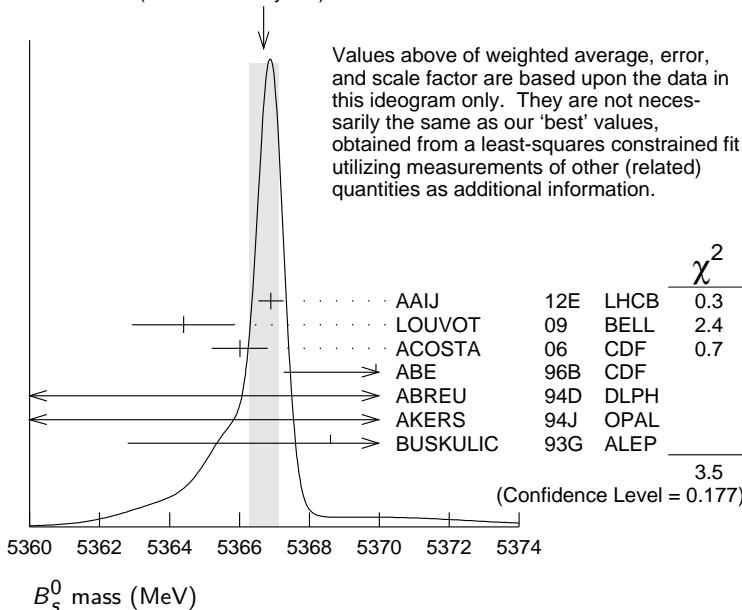
NODE=S086M

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>5366.77 ± 0.24 OUR FIT</b>				
<b>5366.7 ± 0.4 OUR AVERAGE</b>				Error includes scale factor of 1.3. See the ideogram below.
5366.90 ± 0.28 ± 0.23	1	AAIJ	12E	LHCb $p\bar{p}$ at 7 TeV
5364.4 ± 1.3 ± 0.7		LOUVOT	09	BELL $e^+ e^- \rightarrow \gamma(5S)$
5366.01 ± 0.73 ± 0.33	2	ACOSTA	06	CDF $p\bar{p}$ at 1.96 TeV
5369.9 ± 2.3 ± 1.3	32	ABE	96B	CDF $p\bar{p}$ at 1.8 TeV
5374 ± 16 ± 2	3	ABREU	94D	DLPH $e^+ e^- \rightarrow Z$
5359 ± 19 ± 7	1	AKERS	94J	OPAL $e^+ e^- \rightarrow Z$
5368.6 ± 5.6 ± 1.5	2	BUSKULIC	93G	ALEP $e^+ e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5370 ± 1 ± 3		DRUTSKOY	07A	BELL Repl. by LOUVOT 09
5370 ± 40	6	AKERS	94J	OPAL $e^+ e^- \rightarrow Z$
5383.3 ± 4.5 ± 5.0	14	ABE	93F	CDF Repl. by ABE 96B

1 Uses  $B_s^0 \rightarrow J/\psi \phi$  fully reconstructed decays.2 Uses exclusively reconstructed final states containing a  $J/\psi \rightarrow \mu^+ \mu^-$  decays.3 From the decay  $B_s \rightarrow J/\psi(1S)\phi$ .4 From the decay  $B_s \rightarrow D_s^- \pi^+$ .

NODE=S086M;LINKAGE=AA  
 NODE=S086M;LINKAGE=AT  
 NODE=S086M;LINKAGE=A  
 NODE=S086M;LINKAGE=B

WEIGHTED AVERAGE  
 5366.7 ± 0.4 (Error scaled by 1.3)

 $m_{B_s^0} = m_B$ 

NODE=S086DM

 $m_B$  is the average of our  $B$  masses ( $m_{B^\pm} + m_{B^0}$ )/2.

NODE=S086DM

NODE=S086DM

VALUE (MeV)	CL%	DOCUMENT ID	TECN	COMMENT
<b>87.35 ± 0.23 OUR FIT</b>				
<b>87.34 ± 0.29 OUR AVERAGE</b>				
87.42 ± 0.30 ± 0.09	1	AAIJ	12E	LHCb $p\bar{p}$ at 7 TeV
86.64 ± 0.80 ± 0.08	2	ACOSTA	06	CDF $p\bar{p}$ at 1.96 TeV
• • • We use the following data for averages but not for fits. • • •				
89.7 ± 2.7 ± 1.2		ABE	96B	CDF $p\bar{p}$ at 1.8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
80 to 130	68	LEE-FRANZINI 90	CSB2	$e^+ e^- \rightarrow \gamma(5S)$

NOTFITTED

<sup>1</sup>The reported result is  $m_{B_s^0} - m_{B_s^+} = 87.52 \pm 0.30 \pm 0.12$  MeV. We convert it to the mass difference with respect to the average of  $(m_{B_s^0} + m_{B_s^+})/2$ .

<sup>2</sup>The reported result is  $m_{B_s^0} - m_{B_s^0} = 86.38 \pm 0.90 \pm 0.06$  MeV. We convert it to the mass difference with respect to the average of  $(m_{B_s^0} + m_{B_s^0})/2$ .

### $m_{B_s^0} - m_{B_s^0}$

See the  $B_s^0$ - $\bar{B}_s^0$  MIXING section near the end of these  $B_s^0$  Listings.

### $B_s^0$ MEAN LIFE

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at <http://www.slac.stanford.edu/xorg/hfag/>. The averaging/rescaling procedure takes into account correlations between the measurements and asymmetric lifetime errors.

The

First "OUR EVALUATION" is an average of  $1 / [0.5 (\Gamma_{B_s^0} + \Gamma_{B_s^0})]$ .

The Second "OUR EVALUATION" is the average of  $B_s \rightarrow D_s X$  data listed below.

VALUE ( $10^{-12}$ s)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.516±0.011 OUR EVALUATION</b>	First	$[(1.497 \pm 0.015) \times 10^{-12}$ s OUR 2012 EVALUATION]		

<b>1.463±0.032 OUR EVALUATION</b>	Second	$[(1.466 \pm 0.031) \times 10^{-12}$ s OUR 2012 EVALUATION]		
1.518 $\pm 0.041$ $\pm 0.027$	<sup>1</sup> AALTONEN	11AP CDF	$p\bar{p}$ at 1.96 TeV	
1.398 $\pm 0.044$ $\pm 0.028$	<sup>2</sup> ABAZOV	06V D0	$p\bar{p}$ at 1.96 TeV	
1.42 $\pm 0.14$ $\pm 0.03$	<sup>3</sup> ABREU	00Y DLPH	$e^+ e^- \rightarrow Z$	
1.53 $\pm 0.16$ $\pm 0.07$	<sup>4</sup> ABREU,P	00G DLPH	$e^+ e^- \rightarrow Z$	
1.36 $\pm 0.09$ $\pm 0.06$	<sup>5</sup> ABE	99D CDF	$p\bar{p}$ at 1.8 TeV	
1.72 $\pm 0.20$ $\pm 0.18$	<sup>6</sup> ACKERSTAFF	98F OPAL	$e^+ e^- \rightarrow Z$	
1.50 $\pm 0.16$ $\pm 0.04$	<sup>5</sup> ACKERSTAFF	98G OPAL	$e^+ e^- \rightarrow Z$	OCCUR=2
1.47 $\pm 0.14$ $\pm 0.08$	<sup>4</sup> BARATE	98C ALEP	$e^+ e^- \rightarrow Z$	OCCUR=2
1.54 $\pm 0.14$ $\pm 0.04$	<sup>5</sup> BUSKULIC	96M ALEP	$e^+ e^- \rightarrow Z$	OCCUR=2

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.51 $\pm 0.11$	<sup>7</sup> BARATE	98C ALEP	$e^+ e^- \rightarrow Z$	OCCUR=3
1.56 $\pm 0.29$ $\pm 0.08$	<sup>5</sup> ABREU	96F DLPH	Repl. by ABREU 00Y	OCCUR=2
$-0.26$ $-0.07$				
1.65 $\pm 0.34$ $\pm 0.12$	<sup>4</sup> ABREU	96F DLPH	Repl. by ABREU 00Y	OCCUR=3
$-0.31$				
1.76 $\pm 0.20$ $\pm 0.15$	<sup>8</sup> ABREU	96F DLPH	Repl. by ABREU 00Y	OCCUR=4
$-0.10$				
1.60 $\pm 0.26$ $\pm 0.13$	<sup>9</sup> ABREU	96F DLPH	Repl. by ABREU,P 00G	OCCUR=5
$-0.15$				
1.67 $\pm 0.14$	<sup>10</sup> ABREU	96F DLPH	$e^+ e^- \rightarrow Z$	OCCUR=5
1.61 $\pm 0.30$ $\pm 0.18$	<sup>4</sup> BUSKULIC	96E ALEP	Repl. by BARATE 98C	OCCUR=2
$-0.29$ $-0.16$	90			
1.42 $\pm 0.27$ $\pm 0.11$	<sup>5</sup> ABE	95R CDF	Repl. by ABE 99D	
$-0.23$	76			
1.74 $\pm 1.08$ $\pm 0.07$	<sup>11</sup> ABE	95R CDF	Sup. by ABE 96N	
$-0.69$	8			
1.54 $\pm 0.25$ $\pm 0.06$	<sup>5</sup> AKERS	95G OPAL	Repl. by ACKER-STAFF 98G	
$-0.21$	79			
1.59 $\pm 0.17$ $\pm 0.03$	<sup>5</sup> BUSKULIC	95O ALEP	Sup. by BUSKULIC 96M	
$-0.15$	134			
0.96 $\pm 0.37$	<sup>12</sup> ABREU	94E DLPH	Sup. by ABREU 96F	
	41			
1.92 $\pm 0.45$ $\pm 0.04$	<sup>5</sup> BUSKULIC	94C ALEP	Sup. by BUSKULIC 950	
$-0.35$	31			
1.13 $\pm 0.35$ $\pm 0.09$	<sup>5</sup> ACTON	93H OPAL	Sup. by AKERS 95G	
$-0.26$	22			

NODE=S086DM;LINKAGE=AA

NODE=S086DM;LINKAGE=AS

NODE=S086214

NODE=S086214

NODE=S086T

NODE=S086T

- <sup>1</sup> AALTONEN 11AP combines the fully reconstructed  $B_s^0 \rightarrow D_s^- \pi^+$  decays and partially reconstructed  $B_s^0 \rightarrow D_s^- X$  decays.
- <sup>2</sup> Measured using  $D_s^- \mu^+$  vertices.
- <sup>3</sup> Uses  $D_s^- \ell^+$ , and  $\phi \ell^+$  vertices.
- <sup>4</sup> Measured using  $D_s^-$  hadron vertices.
- <sup>5</sup> Measured using  $D_s^- \ell^+$  vertices.
- <sup>6</sup> ACKERSTAFF 98F use fully reconstructed  $D_s^- \rightarrow \phi \pi^-$  and  $D_s^- \rightarrow K^{*0} K^-$  in the inclusive  $B_s^0$  decay.
- <sup>7</sup> Combined results from  $D_s^- \ell^+$  and  $D_s^-$  hadron.
- <sup>8</sup> Measured using  $\phi \ell$  vertices.
- <sup>9</sup> Measured using inclusive  $D_s^-$  vertices.
- <sup>10</sup> Combined result for the four ABREU 96F methods.
- <sup>11</sup> Exclusive reconstruction of  $B_s \rightarrow \psi \phi$ .
- <sup>12</sup> ABREU 94E uses the flight-distance distribution of  $D_s^-$  vertices,  $\phi$ -lepton vertices, and  $D_s^- \mu$  vertices.

NODE=S086T;LINKAGE=AA

NODE=S086T;LINKAGE=BZ

NODE=S086T;LINKAGE=LZ

NODE=S086T;LINKAGE=F

NODE=S086T;LINKAGE=C

NODE=S086T;LINKAGE=K

NODE=S086T;LINKAGE=K6

NODE=S086T;LINKAGE=G

NODE=S086T;LINKAGE=H

NODE=S086T;LINKAGE=I

NODE=S086T;LINKAGE=D

NODE=S086T;LINKAGE=B

## $B_s^0$ MEAN LIFE (Flavor specific)

VALUE ( $10^{-12}$ s)	DOCUMENT ID	TECN	COMMENT
<b>1.463±0.032 OUR EVALUATION</b>			
<b>1.456±0.031 OUR AVERAGE</b>			
1.518±0.041±0.027	<sup>1</sup> AALTONEN	11AP CDF	$p\bar{p}$ at 1.96 TeV
1.398±0.044 <sup>+0.028</sup> <sub>-0.025</sub>	<sup>2</sup> ABAZOV	06V D0	$p\bar{p}$ at 1.96 TeV
1.42 <sup>+0.14</sup> <sub>-0.13</sub> ± 0.03	<sup>3</sup> ABREU	00Y DLPH	$e^+ e^- \rightarrow Z$
1.36 ± 0.09 <sup>+0.06</sup> <sub>-0.05</sub>	<sup>4</sup> ABE	99D CDF	$p\bar{p}$ at 1.8 TeV
1.50 <sup>+0.16</sup> <sub>-0.15</sub> ± 0.04	<sup>4</sup> ACKERSTAFF	98G OPAL	$e^+ e^- \rightarrow Z$
1.54 <sup>+0.14</sup> <sub>-0.13</sub> ± 0.04	<sup>4</sup> BUSKULIC	96M ALEP	$e^+ e^- \rightarrow Z$
<sup>1</sup> AALTONEN 11AP combines the fully reconstructed $B_s^0 \rightarrow D_s^- \pi^+$ decays and partially reconstructed $B_s^0 \rightarrow D_s^- X$ decays.			
<sup>2</sup> Measured using $D_s^- \mu^+$ vertices.			
<sup>3</sup> Uses $D_s^- \ell^+$ , and $\phi \ell^+$ vertices.			
<sup>4</sup> Measured using $D_s^- \ell^+$ vertices.			

NODE=S086TFS

NODE=S086TFS

→ UNCHECKED ←

## $B_s^0$ MEAN LIFE ( $B_s \rightarrow J/\psi \phi$ )

VALUE ( $10^{-12}$ s)	DOCUMENT ID	TECN	COMMENT
<b>1.429±0.088 OUR EVALUATION</b>			
<b>1.517±0.026 OUR AVERAGE</b>			
[(1.42 <sup>+0.08</sup> <sub>-0.07</sub> ) × 10 <sup>-12</sup> s OUR 2012 AVERAGE]			
1.529±0.025±0.012	<sup>1</sup> AALTONEN	12D CDF	$p\bar{p}$ at 1.96 TeV
1.444 <sup>+0.098</sup> <sub>-0.090</sub> ± 0.020	<sup>2</sup> ABAZOV	05B D0	$p\bar{p}$ at 1.96 TeV
1.40 <sup>+0.15</sup> <sub>-0.13</sub> ± 0.02	<sup>1</sup> ACOSTA	05 CDF	$p\bar{p}$ at 1.96 TeV
1.34 <sup>+0.23</sup> <sub>-0.19</sub> ± 0.05	<sup>1</sup> ABE	98B CDF	$p\bar{p}$ at 1.8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1.39 <sup>+0.13</sup> <sub>-0.16</sub> ± 0.01	<sup>1</sup> ABAZOV	05W D0	$p\bar{p}$ at 1.96 TeV
1.34 <sup>+0.23</sup> <sub>-0.19</sub> ± 0.05	<sup>3</sup> ABE	96N CDF	Repl. by ABE 98B
<sup>1</sup> Measured using the time-dependent angular analysis of $B_s^0 \rightarrow J/\psi \phi$ decays.			
<sup>2</sup> Measured using fully reconstructed $B_s \rightarrow J/\psi \phi$ decays.			
<sup>3</sup> ABE 94N uses 58 ± 12 exclusive $B_s \rightarrow J/\psi \phi$ events.			

NODE=S086TFS;LINKAGE=AA

NODE=S086TFS;LINKAGE=AB

NODE=S086TFS;LINKAGE=LZ

NODE=S086TFS;LINKAGE=C

NODE=S086TJP

NODE=S086TJP

→ UNCHECKED ←  
NEW

NODE=S086TJP;LINKAGE=AC

NODE=S086TJP;LINKAGE=CD

NODE=S086TJP;LINKAGE=AB

## $\tau_{B_s^0}/\tau_{B^0}$ MEAN LIFE RATIO

### $\tau_{B_s^0}/\tau_{B^0}$ (direct measurements)

VALUE	DOCUMENT ID	TECN	COMMENT
<b>1.052±0.061±0.015</b>	1 ABAZOV	09E D0	$p\bar{p}$ at 1.96 TeV
<b>• • •</b> We do not use the following data for averages, fits, limits, etc. <b>• • •</b>			
0.980 <sup>+0.076</sup> <sub>-0.071</sub> ± 0.003	2 ABAZOV	05B D0	Repl. by ABAZOV 05W
0.91 ± 0.09 ± 0.003	3 ABAZOV	05W D0	Repl. by ABAZOV 09E
1 Measured the angular and lifetime parameters for the time-dependent angular untagged decays $B_d^0 \rightarrow J/\psi K^0$ and $B_s^0 \rightarrow J/\psi \phi$ .			
2 Measured mean life ratio using fully reconstructed decays.			
3 Measured using the time-dependent angular analysis of $B_s^0 \rightarrow J/\psi \phi$ decays.			

NODE=S086216

NODE=S086TR  
NODE=S086TR

NODE=S086TR;LINKAGE=BA

NODE=S086TR;LINKAGE=AB  
NODE=S086TR;LINKAGE=AC

NODE=S086TSH

NODE=S086TSH

## $B_{sH}^0$ MEAN LIFE

$B_{sH}^0$  is the heavy mass state of two  $B_s^0$  CP eigenstates.

"OUR EVALUATION" has been obtained by the Heavy Flavor Averaging Group (HFAG) using the constraint of the flavor-specific lifetime average in a way similar to  $\Delta\Gamma_{B_s^0}/\Gamma_{B_s^0}$ .

VALUE ( $10^{-12}$ s)	DOCUMENT ID	TECN	COMMENT
<b>1.615±0.021 OUR EVALUATION</b>			
[(1.618 ± 0.024) × $10^{-12}$ s OUR 2012 EVALUATION]			
<b>1.70 ± 0.04 OUR AVERAGE</b>			
[(1.70 ± 0.12) × $10^{-12}$ s OUR 2012 AVERAGE]			
1.700±0.040±0.026	1 AAIJ	12AN LHCb	$p\bar{p}$ at 7 TeV
1.70 <sup>+0.12</sup> <sub>-0.11</sub> ± 0.03	1 AALTONEN	11AB CDF	$p\bar{p}$ at 1.96 TeV
<b>• • •</b> We do not use the following data for averages, fits, limits, etc. <b>• • •</b>			
1.613 <sup>+0.123</sup> <sub>-0.113</sub>	2 AALTONEN	12D CDF	$p\bar{p}$ at 1.96 TeV
1.58 <sup>+0.39</sup> <sub>-0.42</sub> <sup>+0.01</sup> <sub>-0.02</sub>	3,4 AALTONEN	08J CDF	Repl. by AALTONEN 12D
2.07 <sup>+0.58</sup> <sub>-0.46</sub> ± 0.03	4 ABAZOV	05W D0	Repl. by ABAZOV 08AM
	4 ACOSTA	05 CDF	Repl. by AALTONEN 08J
1 Measured using a pure CP-odd final state $J/\psi f_0(980)$ .			
2 Uses the time-dependent angular analysis of $B_s^0 \rightarrow J/\psi \phi$ decays assuming CP-violating angle $\beta_s(B_s^0 \rightarrow J/\psi \phi) = 0.02$ .			
3 Obtained from $\Delta\Gamma_s$ and $\Gamma_s$ fit with a correlation of 0.6.			
4 Measured using the time-dependent angular analysis of $B_s^0 \rightarrow J/\psi \phi$ decays.			

NODE=S086TSH

NEW;→ UNCHECKED ←

NEW

NODE=S086TSH;LINKAGE=AL  
NODE=S086TSH;LINKAGE=ATNODE=S086TSH;LINKAGE=AA  
NODE=S086TSH;LINKAGE=AC

NODE=S086TSL

NODE=S086TSL

## $B_{sL}^0$ MEAN LIFE

$B_{sL}^0$  is the light mass state of two  $B_s^0$  CP eigenstates.

"OUR EVALUATION" has been obtained by the Heavy Flavor Averaging Group (HFAG) using the constraint of the flavor-specific lifetime average in a way similar to  $\Delta\Gamma_{B_s^0}/\Gamma_{B_s^0}$ .

VALUE ( $10^{-12}$ s)	DOCUMENT ID	TECN	COMMENT
<b>1.428±0.013 OUR EVALUATION</b>			
[(1.393 ± 0.019) × $10^{-12}$ s OUR 2012 EVALUATION]			
<b>1.45 ± 0.04 OUR AVERAGE</b>			
[(1.44 ± 0.10) × $10^{-12}$ s OUR 2012 AVERAGE]			
1.440±0.096±0.009	1 AAIJ	12 LHCb	$p\bar{p}$ at 7 TeV
1.455±0.046±0.006	1 AAIJ	12R LHCb	$p\bar{p}$ at 7 TeV
<b>• • •</b> We do not use the following data for averages, fits, limits, etc. <b>• • •</b>			
1.437 <sup>+0.054</sup> <sub>-0.047</sub>	2 AALTONEN	12D CDF	$p\bar{p}$ at 1.96 TeV
1.24 <sup>+0.14</sup> <sub>-0.11</sub> <sup>+0.01</sup> <sub>-0.02</sub>	3,4 AALTONEN	08J CDF	Repl. by AALTONEN 12D
1.05 <sup>+0.16</sup> <sub>-0.13</sub> ± 0.02	4 ABAZOV	05W D0	Repl. by ABAZOV 08AM
1.27 ± 0.33 ± 0.08	4 ACOSTA	05 CDF	Repl. by AALTONEN 08J
	5 BARATE	00K ALEP	$e^+ e^- \rightarrow Z$

NODE=S086TSL

NEW;→ UNCHECKED ←

NEW

- 1 Measured using decays  $B_s^0 \rightarrow K^+ K^-$ .  
 2 Uses the time-dependent angular analysis of  $B_s^0 \rightarrow J/\psi\phi$  decays and assuming  $CP$ -violating angle  $\beta_s(B_s^0 \rightarrow J/\psi\phi) = 0.02$ .  
 3 Obtained from  $\Delta\Gamma_s$  and  $\Gamma_s$  fit with a correlation of 0.6.  
 4 Measured using the time-dependent angular analysis of  $B_s^0 \rightarrow J/\psi\phi$  decays.  
 5 Uses  $\phi\phi$  correlations from  $B_s^0 \rightarrow D_s^{(*)+} D_s^{(*)-}$ .
- 

### $\Delta\Gamma_{B_s^0}/\Gamma_{B_s^0}$

$\Gamma_{B_s^0}$  and  $\Delta\Gamma_{B_s^0}$  are the decay rate average and difference between two  $B_s^0$   $CP$  eigenstates (light – heavy).

“OUR EVALUATION” is an average of all available  $B_s$  flavor-specific lifetime measurements with the  $\Delta\Gamma_{B_s^0}/\Gamma_s$  analyses performed by the Heavy Flavor Averaging Group (HFAG) as described in our “Review on  $B$ – $\bar{B}$  Mixing” in the  $B^0$  Section of these Listings.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>0.123±0.017 OUR EVALUATION</b>				
[0.150 ± 0.020 OUR 2012 EVALUATION]				
0.090±0.009±0.023	1	AAIJ	12D LHCb	$p p$ at 7 TeV
	2	ABAZOV	12D D0	$p\bar{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.147 <sup>+0.036 +0.042</sup> <sub>-0.030 -0.041</sub>	3	ESEN	13 BELL	$e^+ e^- \rightarrow \gamma(5S)$
	4	AALTONEN	12D CDF	$p\bar{p}$ at 1.96 TeV
0.116 <sup>+0.09</sup> <sub>-0.10</sub> ± 0.010	3	ESEN	10 BELL	$e^+ e^- \rightarrow \gamma(5S)$
0.24 <sup>+0.28 +0.03</sup> <sub>-0.38 -0.04</sub>	5	AALTONEN	08J CDF	Repl. by AALTONEN 12D
0.65 <sup>+0.25</sup> <sub>-0.33</sub> ± 0.01	5,6	ABAZOV	05W D0	Repl. by ABAZOV 08AM
	5	ACOSTA	05 CDF	Repl. by AALTONEN 08J
<0.46	95	7 ABREU	00Y DLPH	$e^+ e^- \rightarrow Z$
<0.69	95	8 ABREU,P	00G DLPH	$e^+ e^- \rightarrow Z$
<0.83	95	9 ABE	99D CDF	$p\bar{p}$ at 1.8 TeV
<0.67	95	10 ACCIARRI	98S L3	$e^+ e^- \rightarrow Z$
1 Measured using the time-dependent angular analysis of $B_s^0 \rightarrow J/\psi\phi$ decays. 2 Measured using fully reconstructed $B_s \rightarrow J/\psi\phi$ decays. 3 Assumes $CP$ violation is negligible. 4 Uses the time-dependent angular analysis of $B_s^0 \rightarrow J/\psi\phi$ decays and assuming $CP$ -violating angle $\beta_s(B_s^0 \rightarrow J/\psi\phi) = 0.02$ . 5 Measured using the time-dependent angular analysis of $B_s^0 \rightarrow J/\psi\phi$ decays. 6 Uses $ A_0 ^2 -  A_\parallel ^2 = 0.355 \pm 0.066$ from ACOSTA 05. 7 Uses $D_s^- \ell^+$ , and $\phi\ell^+$ vertices. 8 Measured using $D_s$ hadron vertices. 9 ABE 99D assumes $\tau_{B_s^0} = 1.55 \pm 0.05$ ps. 10 ACCIARRI 98S assumes $\tau_{B_s^0} = 1.49 \pm 0.06$ ps and PDG 98 values of $b$ production fraction.				

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### $\Delta\Gamma_{B_s^0}$

“OUR EVALUATION” has been obtained by the Heavy Flavor Averaging Group (HFAG) using the constraint of the flavor-specific lifetime average in a way similar to  $\Delta\Gamma_{B_s^0}/\Gamma_{B_s^0}$ .

VALUE ( $10^{12} \text{ s}^{-1}$ )	DOCUMENT ID	TECN	COMMENT
<b>0.081±0.011 OUR EVALUATION</b>			
[(0.100 ± 0.013) × $10^{12} \text{ s}^{-1}$ OUR 2012 EVALUATION]			
<b>0.080±0.020 OUR AVERAGE</b>			Error includes scale factor of 1.3. See the ideogram below.
[(0.109 ± 0.022) × $10^{12} \text{ s}^{-1}$ OUR 2012 AVERAGE]			
0.053±0.021±0.010	1 AAD	12CV ATLAS	$p p$ at 7 TeV
0.123±0.029±0.011	1 AAIJ	12D LHCb	$p p$ at 7 TeV
0.068±0.026±0.007	1 AALTONEN	12AJ CDF	$p\bar{p}$ at 1.96 TeV
0.163 <sup>+0.065</sup> <sub>-0.064</sub>	2,3 ABAZOV	12D D0	$p\bar{p}$ at 1.96 TeV

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NODE=S086TSL;LINKAGE=AI  
 NODE=S086TSL;LINKAGE=AT  
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 NODE=S086TSL;LINKAGE=AC  
 NODE=S086TSL;LINKAGE=BA

NODE=S086DRA

NODE=S086DRA

NODE=S086DRA  
 NEW;→ UNCHECKED ←

NODE=S086DRA;LINKAGE=AJ  
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 NODE=S086DRA;LINKAGE=AT

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 NODE=S086DRA;LINKAGE=A

NODE=S086DGS

NODE=S086DGS

NODE=S086DGS  
 NEW;→ UNCHECKED ←

NEW

• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.075 \pm 0.035 \pm 0.006$	<sup>4</sup> AALTONEN	12D	CDF	Repl. by AALTONEN 12AJ
$0.085^{+0.072}_{-0.078} \pm 0.001$	<sup>5</sup> ABAZOV	09E	D0	Repl. by ABAZOV 08AM
$0.076^{+0.059}_{-0.063} \pm 0.006$	<sup>6</sup> AALTONEN	08J	CDF	Repl. by AALTONEN 12D
$0.19 \pm 0.07^{+0.02}_{-0.01}$	<sup>3,7</sup> ABAZOV	08AM	D0	Repl. by ABAZOV 12D
$0.12^{+0.08}_{-0.10} \pm 0.02$	<sup>6,8</sup> ABAZOV	07	D0	Repl. by ABAZOV 07N
$0.13 \pm 0.09$	<sup>9</sup> ABAZOV	07N	D0	Repl. by ABAZOV 09E
$0.47^{+0.19}_{-0.24} \pm 0.01$	<sup>6</sup> ACOSTA	05	CDF	Repl. by AALTONEN 08J

1 Measured using the time-dependent angular analysis of  $B_s^0 \rightarrow J/\psi\phi$  decays.

2 The error includes both statistical and systematic uncertainties.

3 Measured using fully reconstructed  $B_s \rightarrow J/\psi\phi$  decays.

4 Uses the time-dependent angular analysis of  $B_s^0 \rightarrow J/\psi\phi$  decays and assuming  $CP$ -violating angle  $\beta_s(B_s^0 \rightarrow J/\psi\phi) = 0.02$ .

5 Measured the angular and lifetime parameters for the time-dependent angular untagged decays  $B_d^0 \rightarrow J/\psi K^0$  and  $B_s^0 \rightarrow J/\psi\phi$ .

6 Measured using the time-dependent angular analysis of  $B_s^0 \rightarrow J/\psi\phi$  decays and assuming  $CP$ -violating phase  $\phi_s = 0$ .

7 Obtains 90% CL interval  $-0.06 < \Delta\Gamma_s < 0.30$ .

8 ABAZOV 07 reports  $0.17 \pm 0.09 \pm 0.02$  with  $CP$ -violating phase  $\phi_s$  as a free parameter.

9 Combines  $D^0$  measurements of time-dependent angular distributions in  $B_s^0 \rightarrow J/\psi\phi$  and charge asymmetry in semileptonic decays. There is a 4-fold ambiguity in the solution.

NODE=S086DGS;LINKAGE=AJ

NODE=S086DGS;LINKAGE=CE

NODE=S086DGS;LINKAGE=OV

NODE=S086DGS;LINKAGE=AT

NODE=S086DGS;LINKAGE=AB

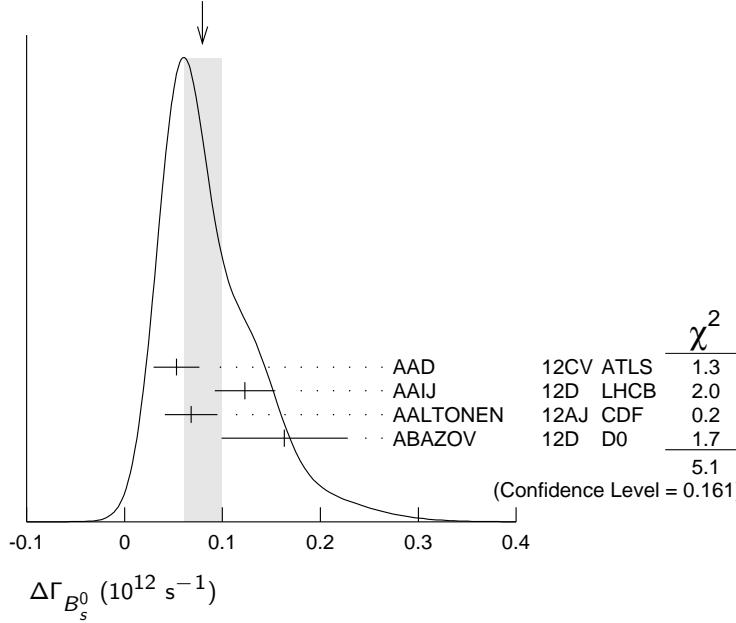
NODE=S086DGS;LINKAGE=AC

NODE=S086DGS;LINKAGE=ZV

NODE=S086DGS;LINKAGE=BZ

NODE=S086DGS;LINKAGE=ZO

WEIGHTED AVERAGE  
0.080 $\pm$ 0.020 (Error scaled by 1.3)



### $\Delta\Gamma_s^{CP} / \Gamma_s$

$\Gamma_s$  and  $\Delta\Gamma_s^{CP}$  are the decay rate average and difference between even,  $\Gamma_s^{CP-even}$ , and odd,  $\Gamma_s^{CP-odd}$ ,  $CP$  eigenstates.

NODE=S086GCP

NODE=S086GCP

NODE=S086GCP

• • • We do not use the following data for averages, fits, limits, etc. • • •

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$0.072 \pm 0.021 \pm 0.022$	1	ABAZOV	09I D0	$p\bar{p}$ at 1.96 TeV
$>0.012$	95	<sup>1</sup> AALTONEN	08F CDF	$p\bar{p}$ at 1.96 TeV
$0.079^{+0.038+0.031}_{-0.035-0.030}$	1	ABAZOV	07Y D0	Repl. by ABAZOV 09I
$0.25^{+0.21}_{-0.14}$	2	BARATE	00K ALEP	$e^+ e^- \rightarrow Z$

<sup>1</sup> Assumes  $2 \text{B}(B_s^0 \rightarrow D_s^{(*)} D_s^{(*)}) \simeq \Delta\Gamma_s^{CP} / \Gamma_s$ .  
<sup>2</sup> Uses  $\phi\phi$  correlations from  $B_s^0 \rightarrow D_s^{(*)+} D_s^{(*)-}$ .

## $1 / \Gamma_{B_s^0}$

"OUR EVALUATION" has been obtained by the Heavy Flavor Averaging Group (HFAG) using the constraint of the flavor-specific lifetime average in a way similar to  $\Delta\Gamma_{B_s^0} / \Gamma_{B_s^0}$ .

VALUE ( $10^{-12} \text{ s}$ )	DOCUMENT ID	TECN	COMMENT
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### **1.516±0.011 OUR EVALUATION**

$[(1.497 \pm 0.015) \times 10^{-12} \text{ s}$  OUR 2012 EVALUATION]

**1.497±0.017 OUR AVERAGE** Error includes scale factor of 1.4. See the ideogram below.  
 $[(1.508 \pm 0.024) \times 10^{-12} \text{ s}$  OUR 2012 AVERAGE Scale factor = 1.4]

$1.477 \pm 0.015 \pm 0.009$	1 AAD	12CV ATLS	$p\bar{p}$ at 7 TeV
$1.522 \pm 0.021 \pm 0.019$	2 AAIJ	12D LHCb	$p\bar{p}$ at 7 TeV
$1.528 \pm 0.019 \pm 0.009$	3 AALTONEN	12AJ CDF	$p\bar{p}$ at 1.96 TeV
$1.443^{+0.038}_{-0.035}$	3,4 ABAZOV	12D D0	$p\bar{p}$ at 1.96 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

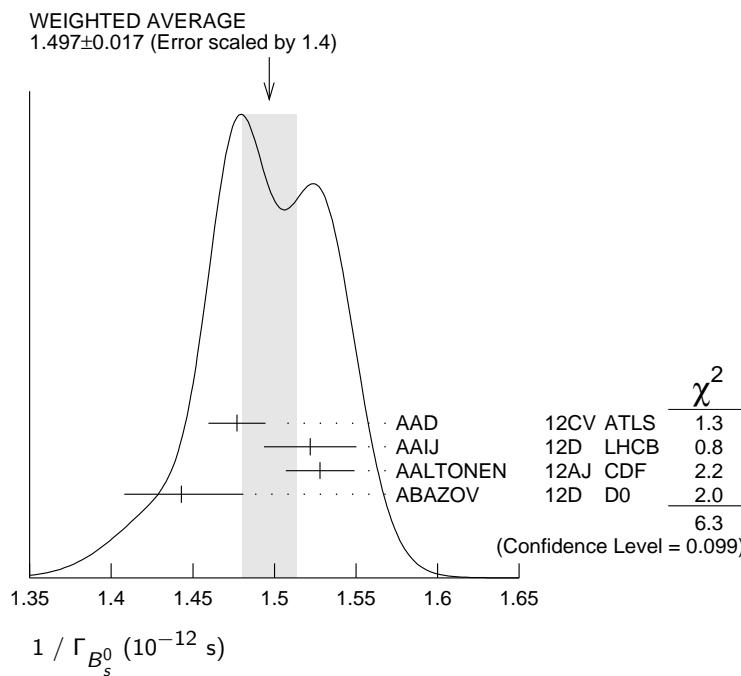
$1.529 \pm 0.025 \pm 0.012$	3 AALTONEN	12D CDF	Repl. by AALTONEN 12AJ
$1.487 \pm 0.060 \pm 0.028$	3 ABABOV	09E D0	Repl. by ABABOV 08AM
$1.52 \pm 0.04 \pm 0.02$	3 AALTONEN	08J CDF	Repl. by AALTONEN 12D
$1.52 \pm 0.05 \pm 0.01$	3 ABABOV	08AM D0	Repl. by ABABOV 12D

1 AAD 12CV reports  $\Gamma_{B_s^0} = 0.677 \pm 0.007 \pm 0.004 \text{ ps}^{-1}$  measured using a time-dependent angular analysis of  $B_s^0 \rightarrow J/\psi\phi$  decays.

2 AAIJ 12D reports average decay width of  $B_s^0$ ,  $\Gamma_{B_s^0} = 0.657 \pm 0.009 \pm 0.008 \text{ ps}^{-1}$  that we converted to  $1/\Gamma_{B_s^0}$ .

3 Measured using the time-dependent angular analysis of  $B_s^0 \rightarrow J/\psi\phi$  decays.

4 The error includes both statistical and systematic uncertainties.



## $B_s^0$ DECAY MODES

These branching fractions all scale with  $\text{B}(\bar{b} \rightarrow B_s^0)$ .

The branching fraction  $\text{B}(B_s^0 \rightarrow D_s^- \ell^+ \nu_\ell \text{anything})$  is not a pure measurement since the measured product branching fraction  $\text{B}(\bar{b} \rightarrow B_s^0) \times$

NODE=S086GCP;LINKAGE=AB

NODE=S086GCP;LINKAGE=KB

NODE=S086MLF

NODE=S086MLF

NODE=S086MLF

NEW;→ UNCHECKED ←

NEW

NODE=S086MLF;LINKAGE=AD

NODE=S086MLF;LINKAGE=AJ

NODE=S086MLF;LINKAGE=AC

NODE=S086MLF;LINKAGE=CE

NODE=S086215;NODE=S086

NODE=S086

$B(B_s^0 \rightarrow D_s^- \ell^+ \nu_\ell \text{anything})$  was used to determine  $B(\bar{b} \rightarrow B_s^0)$ , as described in the note on “ $B^0\text{-}\bar{B}^0$  Mixing”

For inclusive branching fractions, e.g.,  $B \rightarrow D^\pm \text{anything}$ , the values usually are multiplicities, not branching fractions. They can be greater than one.

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level	
$\Gamma_1 D_s^- \text{anything}$	(93 $\pm$ 25) %	DESIG=8	
$\Gamma_2 \ell \nu_\ell X$	( 9.5 $\pm$ 2.7 ) %	DESIG=49	
$\Gamma_3 D_s^- \ell^+ \nu_\ell \text{anything}$	[a] ( 7.9 $\pm$ 2.4 ) %	DESIG=4	
$\Gamma_4 D_{s1}(2536)^- \mu^+ \nu_\mu,$ $D_{s1}^- \rightarrow D^{*-} K_S^0$	( 2.6 $\pm$ 0.7 ) $\times 10^{-3}$	DESIG=36	
$\Gamma_5 D_{s1}(2536)^- X \mu^+ \nu,$ $D_{s1}^- \rightarrow \bar{D}^0 K^+$	( 4.3 $\pm$ 1.7 ) $\times 10^{-3}$	DESIG=46	
$\Gamma_6 D_{s2}(2573)^- X \mu^+ \nu,$ $D_{s2}^- \rightarrow \bar{D}^0 K^+$	( 2.6 $\pm$ 1.2 ) $\times 10^{-3}$	DESIG=47	
$\Gamma_7 D_s^- \pi^+$	( 3.04 $\pm$ 0.23 ) $\times 10^{-3}$	DESIG=5	
$\Gamma_8 D_s^- \rho^+$	( 7.0 $\pm$ 1.5 ) $\times 10^{-3}$	DESIG=39	
$\Gamma_9 D_s^- \pi^+ \pi^+ \pi^-$	( 6.3 $\pm$ 1.1 ) $\times 10^{-3}$	DESIG=32	
$\Gamma_{10} D_{s1}(2536)^- \pi^+,$ $D_{s1}^- \rightarrow D_s^- \pi^+ \pi^-$	( 2.5 $\pm$ 0.8 ) $\times 10^{-5}$	DESIG=58	
$\Gamma_{11} D_s^\mp K^\pm$	( 2.03 $\pm$ 0.28 ) $\times 10^{-4}$	S=1.3	DESIG=37
$\Gamma_{12} D_s^- K^+ \pi^+ \pi^-$	( 3.3 $\pm$ 0.7 ) $\times 10^{-4}$	DESIG=57	
$\Gamma_{13} D_s^+ D_s^-$	( 5.3 $\pm$ 0.8 ) $\times 10^{-3}$	DESIG=33	
$\Gamma_{14} D_s^{*-} \pi^+$	( 2.0 $\pm$ 0.5 ) $\times 10^{-3}$	DESIG=40	
$\Gamma_{15} D_s^{*-} \rho^+$	( 9.7 $\pm$ 2.2 ) $\times 10^{-3}$	DESIG=41	
$\Gamma_{16} D_s^{*+} D_s^- + D_s^{*-} D_s^+$	( 1.30 $\pm$ 0.22 ) %	S=1.1	DESIG=34
$\Gamma_{17} D_s^{*+} D_s^{*-}$	( 1.87 $\pm$ 0.30 ) %	DESIG=35	
$\Gamma_{18} D_s^{(*)+} D_s^{(*)-}$	( 4.5 $\pm$ 1.4 ) %	DESIG=24	
$\Gamma_{19} \bar{D}^0 \bar{K}^*(892)^0$	( 4.7 $\pm$ 1.4 ) $\times 10^{-4}$	DESIG=48	
$\Gamma_{20} \bar{D}^0 K^+ K^-$	( 4.2 $\pm$ 1.9 ) $\times 10^{-5}$	DESIG=51	
$\Gamma_{21} J/\psi(1S) \phi$	(10.0 $\pm$ 3.2 ) $\times 10^{-4}$	DESIG=7	
$\Gamma_{22} J/\psi(1S) \pi^0$	< 1.2 $\times 10^{-3}$	CL=90%	DESIG=21
$\Gamma_{23} J/\psi(1S) \eta$	( 4.0 $\pm$ 0.7 ) $\times 10^{-4}$	S=1.3	DESIG=22
$\Gamma_{24} J/\psi(1S) K_S^0$	( 2.1 $\pm$ 0.6 ) $\times 10^{-5}$	S=2.1	DESIG=44
$\Gamma_{25} J/\psi(1S) K^*(892)^0$	( 4.4 $\pm$ 0.9 ) $\times 10^{-5}$	DESIG=45	
$\Gamma_{26} J/\psi(1S) \eta'$	( 3.4 $\pm$ 0.5 ) $\times 10^{-4}$	DESIG=50	
$\Gamma_{27} J/\psi(1S) \pi^+ \pi^-$	( 2.0 $\pm$ 0.6 ) $\times 10^{-4}$	DESIG=52	
$\Gamma_{28} J/\psi(1S) f_0(980), f_0 \rightarrow \pi^+ \pi^-$	( 1.29 $\pm$ 0.40 ) $\times 10^{-4}$	DESIG=42	
$\Gamma_{29} J/\psi(1S) f_0(1370), f_0 \rightarrow \pi^+ \pi^-$	( 3.9 $\pm$ 0.9 ) $\times 10^{-5}$	DESIG=43	
$\Gamma_{30} J/\psi(1S) f_2(1270), f_2 \rightarrow \pi^+ \pi^-$	(10 $\pm$ 5/4 ) $\times 10^{-7}$	DESIG=53	
$\Gamma_{31} J/\psi(1S) \pi^+ \pi^- (\text{nonresonant})$	( 1.7 $\pm$ 1.1/0.4 ) $\times 10^{-5}$	DESIG=54	
$\Gamma_{32} J/\psi(1S) f'_2(1525)$	( 2.6 $\pm$ 0.9 ) $\times 10^{-4}$	DESIG=56	
$\Gamma_{33} \psi(2S) f'_2(1525)$	( 2.1 $\pm$ 1.0 ) $\times 10^{-4}$	DESIG=55	
$\Gamma_{34} \psi(2S) \phi$	( 5.0 $\pm$ 1.6 ) $\times 10^{-4}$	DESIG=6	
$\Gamma_{35} \pi^+ \pi^-$	( 7.6 $\pm$ 1.9 ) $\times 10^{-7}$	S=1.4	DESIG=16

$\Gamma_{36}$	$\pi^0 \pi^0$	$< 2.1$	$\times 10^{-4}$	CL=90%	DESIG=14
$\Gamma_{37}$	$\eta \pi^0$	$< 1.0$	$\times 10^{-3}$	CL=90%	DESIG=13
$\Gamma_{38}$	$\eta \eta$	$< 1.5$	$\times 10^{-3}$	CL=90%	DESIG=12
$\Gamma_{39}$	$\rho^0 \rho^0$	$< 3.20$	$\times 10^{-4}$	CL=90%	DESIG=25
$\Gamma_{40}$	$\phi \rho^0$	$< 6.17$	$\times 10^{-4}$	CL=90%	DESIG=28
$\Gamma_{41}$	$\phi \phi$	$( 1.8 \pm 0.6 ) \times 10^{-5}$			DESIG=30
$\Gamma_{42}$	$\pi^+ K^-$	$( 5.5 \pm 0.6 ) \times 10^{-6}$			DESIG=9
$\Gamma_{43}$	$K^+ K^-$	$( 2.52 \pm 0.17 ) \times 10^{-5}$			DESIG=10
$\Gamma_{44}$	$K^0 \bar{K}^0$	$< 6.6$	$\times 10^{-5}$	CL=90%	DESIG=38
$\Gamma_{45}$	$\bar{K}^*(892)^0 \rho^0$	$< 7.67$	$\times 10^{-4}$	CL=90%	DESIG=26
$\Gamma_{46}$	$\bar{K}^*(892)^0 K^*(892)^0$	$( 2.8 \pm 0.7 ) \times 10^{-5}$			DESIG=27
$\Gamma_{47}$	$\phi K^*(892)^0$	$< 1.013$	$\times 10^{-3}$	CL=90%	DESIG=29
$\Gamma_{48}$	$p \bar{p}$	$< 5.9$	$\times 10^{-5}$	CL=90%	DESIG=17
$\Gamma_{49}$	$\gamma \gamma$	$B1$	$< 8.7$	$\times 10^{-6}$	CL=90%
$\Gamma_{50}$	$\phi \gamma$		$( 3.6 \pm 0.4 ) \times 10^{-5}$		DESIG=18

**Lepton Family number (*LF*) violating modes or  
 $\Delta B = 1$  weak neutral current (*B1*) modes**

$\Gamma_{51}$	$\mu^+ \mu^-$	$B1$	$( 3.2 \pm 1.5 ) \times 10^{-9}$		DESIG=15	
$\Gamma_{52}$	$e^+ e^-$	$B1$	$< 2.8$	$\times 10^{-7}$	CL=90%	DESIG=20
$\Gamma_{53}$	$e^\pm \mu^\mp$	$LF$	$[b] < 2.0$	$\times 10^{-7}$	CL=90%	DESIG=23
$\Gamma_{54}$	$\phi(1020) \mu^+ \mu^-$	$B1$	$( 1.13 \pm 0.40 ) \times 10^{-6}$		DESIG=31	
$\Gamma_{55}$	$\phi \nu \bar{\nu}$	$B1$	$< 5.4$	$\times 10^{-3}$	CL=90%	DESIG=19

[a] Not a pure measurement. See note at head of  $B_s^0$  Decay Modes.

[b] The value is for the sum of the charge states or particle/antiparticle states indicated.

NODE=S086;CLUMP=B

LINKAGE=X86

LINKAGE=SG

### CONSTRAINED FIT INFORMATION

An overall fit to 10 branching ratios uses 16 measurements and one constraint to determine 7 parameters. The overall fit has a  $\chi^2 = 5.0$  for 10 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients  $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$ , in percent, from the fit to the branching fractions,  $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$ . The fit constrains the  $x_i$  whose labels appear in this array to sum to one.

$x_9$	28				
$x_{11}$	55	16			
$x_{21}$	0	0	0		
$x_{28}$	0	0	0	96	
$x_{29}$	0	0	0	52	50
	$x_7$	$x_9$	$x_{11}$	$x_{21}$	$x_{28}$

### $B_s^0$ BRANCHING RATIOS

NODE=S086230

$\Gamma(D_s^- \text{anything}) / \Gamma_{\text{total}}$

$\Gamma_1 / \Gamma$

NODE=S086R5

NODE=S086R5

NODE=S086R5

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.93±0.25 OUR AVERAGE</b>				
0.91±0.18±0.41		<sup>1</sup> DRUTSKOY	07 BELL	$e^+ e^- \rightarrow \gamma(4S)$
0.81±0.24±0.22	90	<sup>2</sup> BUSKULIC	96E ALEP	$e^+ e^- \rightarrow Z$
1.56±0.58±0.44	147	<sup>3</sup> ACTON	92N OPAL	$e^+ e^- \rightarrow Z$

<sup>1</sup>The extraction of this result takes into account the correlation between the measurements of  $B(\gamma(5S) \rightarrow D_s X)$  and  $B(\gamma(5S) \rightarrow D^0 X)$ .

<sup>2</sup>BUSKULIC 96E separate  $c\bar{c}$  and  $b\bar{b}$  sources of  $D_s^+$  mesons using a lifetime tag, subtract generic  $\bar{b} \rightarrow W^+ \rightarrow D_s^+$  events, and obtain  $B(\bar{b} \rightarrow B_s^0) \times B(B_s^0 \rightarrow D_s^- \text{ anything}) = 0.088 \pm 0.020 \pm 0.020$  assuming  $B(D_s \rightarrow \phi\pi) = (3.5 \pm 0.4) \times 10^{-2}$  and PDG 1994 values for the relative partial widths to other  $D_s$  channels. We evaluate using our current values  $B(\bar{b} \rightarrow B_s^0) = 0.107 \pm 0.014$  and  $B(D_s \rightarrow \phi\pi) = 0.036 \pm 0.009$ . Our first error is their experiment's and our second error is that due to  $B(\bar{b} \rightarrow B_s^0)$  and  $B(D_s \rightarrow \phi\pi)$ .

<sup>3</sup>ACTON 92N assume that excess of  $147 \pm 48$   $D_s^0$  events over that expected from  $B^0$ ,  $B^+$ , and  $c\bar{c}$  is all from  $B_s^0$  decay. The product branching fraction is measured to be  $B(\bar{b} \rightarrow B_s^0)B(B_s^0 \rightarrow D_s^- \text{ anything}) \times B(D_s^- \rightarrow \phi\pi^-) = (5.9 \pm 1.9 \pm 1.1) \times 10^{-3}$ . We evaluate using our current values  $B(\bar{b} \rightarrow B_s^0) = 0.107 \pm 0.014$  and  $B(D_s \rightarrow \phi\pi) = 0.036 \pm 0.009$ . Our first error is their experiment's and our second error is that due to  $B(\bar{b} \rightarrow B_s^0)$  and  $B(D_s \rightarrow \phi\pi)$ .

$\Gamma(\ell\nu_\ell X)/\Gamma_{\text{total}}$	$\Gamma_2/\Gamma$		
<u>VALUE (units <math>10^{-2}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>9.5^{+2.5}_{-2.0}{}^{+1.1}_{-1.9}</math></b>	<sup>1</sup> LEES	12A BABR	$e^+ e^-$

<sup>1</sup>The measurement corresponds to a branching fraction where the lepton originates from bottom decay and is the average between the electron and muon branching fractions. LEES 12A uses the correlation of the production of  $\phi$  mesons in association with a lepton in  $e^+ e^-$  data taken at center-of-mass energies between 10.54 and 11.2 GeV.

$\Gamma(D_s^- \ell^+ \nu_\ell \text{anything})/\Gamma_{\text{total}}$	$\Gamma_3/\Gamma$			
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>

The values and averages in this section serve only to show what values result if one assumes our  $B(\bar{b} \rightarrow B_s^0)$ . They cannot be thought of as measurements since the underlying product branching fractions were also used to determine  $B(\bar{b} \rightarrow B_s^0)$  as described in the note on "Production and Decay of  $b$ -Flavored Hadrons."

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>0.079 \pm 0.024</math> OUR AVERAGE</b>				
0.076 $\pm 0.012 \pm 0.021$	134	<sup>1</sup> BUSKULIC	950 ALEP	$e^+ e^- \rightarrow Z$
0.107 $\pm 0.043 \pm 0.029$		<sup>2</sup> ABREU	92M DLPH	$e^+ e^- \rightarrow Z$
0.103 $\pm 0.036 \pm 0.028$	18	<sup>3</sup> ACTON	92N OPAL	$e^+ e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.13 $\pm 0.04 \pm 0.04$	27	<sup>4</sup> BUSKULIC	92E ALEP	$e^+ e^- \rightarrow Z$

<sup>1</sup>BUSKULIC 950 use  $D_s \ell$  correlations. The measured product branching ratio is  $B(\bar{b} \rightarrow B_s^-) \times B(B_s^- \rightarrow D_s^- \ell^+ \nu_\ell \text{anything}) = (0.82 \pm 0.09^{+0.13}_{-0.14})\%$  assuming  $B(D_s \rightarrow \phi\pi) = (3.5 \pm 0.4) \times 10^{-2}$  and PDG 1994 values for the relative partial widths to the six other  $D_s$  channels used in this analysis. Combined with results from  $\Upsilon(4S)$  experiments this can be used to extract  $B(\bar{b} \rightarrow B_s^-) = (11.0 \pm 1.2^{+2.5}_{-2.6})\%$ . We evaluate using our current values  $B(\bar{b} \rightarrow B_s^0) = 0.107 \pm 0.014$  and  $B(D_s \rightarrow \phi\pi) = 0.036 \pm 0.009$ . Our first error is their experiment's and our second error is that due to  $B(\bar{b} \rightarrow B_s^0)$  and  $B(D_s \rightarrow \phi\pi)$ .

<sup>2</sup>ABREU 92M measured muons only and obtained product branching ratio  $B(Z \rightarrow b\bar{b}) \times B(\bar{b} \rightarrow B_s^-) \times B(B_s^- \rightarrow D_s^- \mu^+ \nu_\mu \text{anything}) \times B(D_s^- \rightarrow \phi\pi) = (18 \pm 8) \times 10^{-5}$ . We evaluate using our current values  $B(\bar{b} \rightarrow B_s^0) = 0.107 \pm 0.014$  and  $B(D_s \rightarrow \phi\pi) = 0.036 \pm 0.009$ . Our first error is their experiment's and our second error is that due to  $B(\bar{b} \rightarrow B_s^0)$  and  $B(D_s \rightarrow \phi\pi)$ . We use  $B(Z \rightarrow b\bar{b}) = 2B(Z \rightarrow b\bar{b}) = 2 \times (0.2212 \pm 0.0019)$ .

<sup>3</sup>ACTON 92N is measured using  $D_s \rightarrow \phi\pi^+$  and  $K^*(892)^0 K^+$  events. The product branching fraction measured is measured to be  $B(\bar{b} \rightarrow B_s^0)B(B_s^0 \rightarrow D_s^- \ell^+ \nu_\ell \text{anything}) \times B(D_s^- \rightarrow \phi\pi^-) = (3.9 \pm 1.1 \pm 0.8) \times 10^{-4}$ . We evaluate using our current values  $B(\bar{b} \rightarrow B_s^0) = 0.107 \pm 0.014$  and  $B(D_s \rightarrow \phi\pi) = 0.036 \pm 0.009$ . Our first error is their experiment's and our second error is that due to  $B(\bar{b} \rightarrow B_s^0)$  and  $B(D_s \rightarrow \phi\pi)$ .

<sup>4</sup>BUSKULIC 92E is measured using  $D_s \rightarrow \phi\pi^+$  and  $K^*(892)^0 K^+$  events. They use 2.7  $\pm$  0.7% for the  $\phi\pi^+$  branching fraction. The average product branching fraction is measured to be  $B(\bar{b} \rightarrow B_s^0)B(B_s^0 \rightarrow D_s^- \ell^+ \nu_\ell \text{anything}) = 0.020 \pm 0.005^{+0.005}_{-0.006}$ . We evaluate using our current values  $B(\bar{b} \rightarrow B_s^0) = 0.107 \pm 0.014$  and  $B(D_s \rightarrow \phi\pi) = 0.036 \pm 0.009$ . Our first error is their experiment's and our second error is that due to  $B(\bar{b} \rightarrow B_s^0)$  and  $B(D_s \rightarrow \phi\pi)$ . Superseded by BUSKULIC 950.

NODE=S086R5;LINKAGE=DR

NODE=S086R5;LINKAGE=B

NODE=S086R5;LINKAGE=A

NODE=S086R54  
NODE=S086R54

NODE=S086R54;LINKAGE=LE

NODE=S086R2  
NODE=S086R2NODE=S086R2  
SYCLP=A  
SYCLP=A  
SYCLP=A

NODE=S086R2;LINKAGE=AE

NODE=S086R2;LINKAGE=A

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$\Gamma(D_{s1}(2536)^-\mu^+\nu_\mu, D_{s1}^- \rightarrow D^{*-} K_S^0)/\Gamma_{\text{total}}$	$\Gamma_4/\Gamma$			
$\text{VALUE (units } 10^{-3}\text{)}$	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>2.6±0.7 OUR AVERAGE</b>	$[(2.5 \pm 0.7) \times 10^{-3}$ OUR 2012 AVERAGE]			
<b>2.6±0.7±0.1</b>	<sup>1</sup> ABAZOV	09G D0	$p\bar{p}$ at 1.96 TeV	
1 ABAZOV 09G reports $[\Gamma(B_s^0 \rightarrow D_{s1}(2536)^-\mu^+\nu_\mu, D_{s1}^- \rightarrow D^{*-} K_S^0)/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow B_s^0)] = (2.66 \pm 0.52 \pm 0.45) \times 10^{-4}$ which we divide by our best value $B(\bar{b} \rightarrow B_s^0) = (10.4 \pm 0.6) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.				
$\Gamma(D_{s1}(2536)^-X\mu^+\nu, D_{s1}^- \rightarrow \bar{D}^0 K^+)/\Gamma(D_s^- \ell^+ \nu_\ell \text{anything})$	$\Gamma_5/\Gamma_3$			
$\text{VALUE (units } 10^{-2}\text{)}$	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>5.4±1.2±0.5</b>	AAIJ	11A LHCb	$p\bar{p}$ at 7 TeV	
$\Gamma(D_{s2}(2573)^-X\mu^+\nu, D_{s2}^- \rightarrow \bar{D}^0 K^+)/\Gamma(D_s^- \ell^+ \nu_\ell \text{anything})$	$\Gamma_6/\Gamma_3$			
$\text{VALUE (units } 10^{-2}\text{)}$	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>3.3±1.0±0.4</b>	AAIJ	11A LHCb	$p\bar{p}$ at 7 TeV	
$\Gamma(D_{s1}(2536)^-X\mu^+\nu, D_{s1}^- \rightarrow \bar{D}^0 K^+)/\Gamma(D_{s2}(2573)^-X\mu^+\nu, D_{s2}^- \rightarrow \bar{D}^0 K^+)$	$\Gamma_5/\Gamma_6$			
$\text{VALUE}$	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.61±0.14±0.05	<sup>1</sup> AAIJ	11A LHCb	$p\bar{p}$ at 7 TeV	
1 Not independent of other AAIJ 11A measurements.				
$\Gamma(D_s^-\pi^+)/\Gamma_{\text{total}}$	$\Gamma_7/\Gamma$			
$\text{VALUE (units } 10^{-3}\text{)}$	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>3.04±0.23 OUR FIT</b>				
$[(3.2 \pm 0.4) \times 10^{-3}$ OUR 2012 FIT]				
<b>3.02±0.24 OUR AVERAGE</b>				
$[(3.3 \pm 0.5) \times 10^{-3}$ OUR 2012 AVERAGE]				
2.95±0.05 <sup>+0.25</sup> <sub>-0.28</sub>	<sup>1</sup> AAIJ	12AG LHCb	$p\bar{p}$ at 7 TeV	
3.6 ± 0.5 ± 0.5	<sup>2</sup> LOUVOT	09 BELL	$e^+e^- \rightarrow \gamma(5S)$	
3.0 ± 0.7 ± 0.1	<sup>3</sup> ABULENCIA	07C CDF	$p\bar{p}$ at 1.96 TeV	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
6.8 ± 2.2 ± 1.6	DRUTSKOY	07A BELL	Repl. by LOUVOT 09	
3.5 ± 1.1 ± 0.2	<sup>4</sup> ABULENCIA	06J CDF	Repl. by ABULENCIA 07C	
<130 seen	<sup>5</sup> AKERS	94J OPAL	$e^+e^- \rightarrow Z$	
	1 BUSKULIC	93G ALEP	$e^+e^- \rightarrow Z$	
1 AAIJ 12AG reports $(2.95 \pm 0.05 \pm 0.17)^{+0.18}_{-0.22} \times 10^{-3}$ where the last uncertainty comes from the semileptonic $f_s/f_d$ measurement. We combined the systematics in quadrature.				
2 LOUVOT 09 reports $(3.67^{+0.35+0.65}_{-0.33-0.645}) \times 10^{-3}$ from a measurement of $[\Gamma(B_s^0 \rightarrow D_s^-\pi^+)/\Gamma_{\text{total}}] \times [B(\gamma(10860) \rightarrow B_s^{(*)}\bar{B}_s^{(*)})]$ assuming $B(\gamma(10860) \rightarrow B_s^{(*)}\bar{B}_s^{(*)}) = (19.5 \pm 2.6) \times 10^{-2}$ , which we rescale to our best value $B(\gamma(10860) \rightarrow B_s^{(*)}\bar{B}_s^{(*)}) = (19.9 \pm 3.0) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.				
3 ABULENCIA 07C reports $[\Gamma(B_s^0 \rightarrow D_s^-\pi^+)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow D^-\pi^+)] = 1.13 \pm 0.08 \pm 0.23$ which we multiply by our best value $B(B^0 \rightarrow D^-\pi^+) = (2.68 \pm 0.13) \times 10^{-3}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.				
4 ABULENCIA 06J reports $[\Gamma(B_s^0 \rightarrow D_s^-\pi^+)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow D^-\pi^+)] = 1.32 \pm 0.18 \pm 0.38$ which we multiply by our best value $B(B^0 \rightarrow D^-\pi^+) = (2.68 \pm 0.13) \times 10^{-3}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.				
5 AKERS 94J sees $\leq 6$ events and measures the limit on the product branching fraction $f(\bar{b} \rightarrow B_s^0) \cdot B(B_s^0 \rightarrow D_s^-\pi^+) < 1.3\%$ at CL = 90%. We divide by our current value $B(\bar{b} \rightarrow B_s^0) = 0.105$ .				

$\Gamma(D_s^- \rho^+)/\Gamma_{\text{total}}$	$\Gamma_8/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

**7.0±1.5 OUR AVERAGE**  $[(7.4 \pm 1.7) \times 10^{-3}$  OUR 2012 AVERAGE]

**7.0±1.4±0.5** <sup>1</sup>LOUVOT 10 BELL  $e^+ e^- \rightarrow \gamma(5S)$

<sup>1</sup> LOUVOT 10 reports  $[\Gamma(B_s^0 \rightarrow D_s^- \rho^+)/\Gamma_{\text{total}}] / [B(B_s^0 \rightarrow D_s^- \pi^+)] = 2.3 \pm 0.4 \pm 0.2$

which we multiply by our best value  $B(B_s^0 \rightarrow D_s^- \pi^+) = (3.04 \pm 0.23) \times 10^{-3}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D_s^- \pi^+ \pi^+ \pi^-)/\Gamma_{\text{total}}$	$\Gamma_9/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

**6.3±1.1 OUR FIT**

$[(6.5 \pm 1.2) \times 10^{-3}$  OUR 2012 FIT]

**6.7±1.5±0.7** <sup>1</sup>ABULENCIA 07C CDF  $p\bar{p}$  at 1.96 TeV

<sup>1</sup> ABULENCIA 07C reports  $[\Gamma(B_s^0 \rightarrow D_s^- \pi^+ \pi^+ \pi^-)/\Gamma_{\text{total}}] / [B(B_s^0 \rightarrow D_s^- \pi^+ \pi^+ \pi^-)] = 1.05 \pm 0.10 \pm 0.22$  which we multiply by our best value  $B(B_s^0 \rightarrow D_s^- \pi^+ \pi^+ \pi^-) = (6.4 \pm 0.7) \times 10^{-3}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D_s^- \pi^+ \pi^+ \pi^-)/\Gamma(D_s^- \pi^+)$	$\Gamma_9/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

**2.08±0.34 OUR FIT**

$[2.04 \pm 0.35$  OUR 2012 FIT]

**2.01±0.37±0.20**

AAIJ 11E LHCb  $p\bar{p}$  at 7 TeV

$\Gamma(D_{s1}(2536)^- \pi^+, D_{s1}^- \rightarrow D_s^- \pi^+ \pi^-)/\Gamma(D_s^- \pi^+ \pi^-)$	$\Gamma_{10}/\Gamma_9$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

**4.0±1.0±0.4**

AAIJ 12AX LHCb  $p\bar{p}$  at 7 TeV

$\Gamma(D_s^\mp K^\pm)/\Gamma_{\text{total}}$	$\Gamma_{11}/\Gamma$
<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

**2.03±0.28 OUR FIT** Error includes scale factor of 1.3.  $[(2.9 \pm 0.6) \times 10^{-4}$  OUR 2012 FIT]

**2.4 <sup>+1.2</sup> <sub>-1.0</sub> ±0.4**

<sup>1</sup>LOUVOT 09 BELL  $e^+ e^- \rightarrow \gamma(5S)$

<sup>1</sup> LOUVOT 09 reports  $(2.4^{+1.2}_{-1.0} \pm 0.42) \times 10^{-4}$  from a measurement of  $[\Gamma(B_s^0 \rightarrow D_s^\mp K^\pm)/\Gamma_{\text{total}}] \times [B(\gamma(10860) \rightarrow B_s^{(*)}\bar{B}_s^{(*)})]$  assuming  $B(\gamma(10860) \rightarrow B_s^{(*)}\bar{B}_s^{(*)}) = (19.5 \pm 2.6) \times 10^{-2}$ , which we rescale to our best value  $B(\gamma(10860) \rightarrow B_s^{(*)}\bar{B}_s^{(*)}) = (19.9 \pm 3.0) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D_s^\mp K^\pm)/\Gamma(D_s^- \pi^+)$	$\Gamma_{11}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

**0.067 ±0.008 OUR FIT** Error includes scale factor of 1.6.  $[0.092 \pm 0.018$  OUR 2012 FIT]

**0.066 ±0.008 OUR AVERAGE** Error includes scale factor of 1.6.  $[0.097 \pm 0.020$  OUR 2012 AVERAGE]

0.0646±0.0043±0.0025 AAIJ 12AG LHCb  $p\bar{p}$  at 7 TeV  
0.097 ±0.018 ±0.009 AALTOMEN 09AQ CDF  $p\bar{p}$  at 1.96 TeV

$\Gamma(D_s^- K^+ \pi^+ \pi^-)/\Gamma(D_s^- \pi^+ \pi^+ \pi^-)$	$\Gamma_{12}/\Gamma_9$
<u>VALUE (units <math>10^{-2}</math>)</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

**5.2±0.5±0.3** AAIJ 12AX LHCb  $p\bar{p}$  at 7 TeV

$\Gamma(D_s^+ D_s^-)/\Gamma_{\text{total}}$	$\Gamma_{13}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>CL%</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

**5.3±0.8 OUR AVERAGE**

$[(5.3 \pm 0.9) \times 10^{-3}$  OUR 2012 AVERAGE]

$5.8^{+1.1}_{-0.9} \pm 1.3$  <sup>1</sup>ESEN 13 BELL  $e^+ e^- \rightarrow \gamma(5S)$   
 $5.1 \pm 0.8 \pm 0.6$  <sup>2</sup>AALTOMEN 12C CDF  $p\bar{p}$  at 1.96 TeV

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NODE=S086R40

NEW

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NODE=S086R30  
NEW

NODE=S086R30;LINKAGE=AB

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NEW

NEW

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NODE=S086R57

NODE=S086R32  
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NEW

• • • We do not use the following data for averages, fits, limits, etc. • • •

$10.3^{+3.9+2.6}_{-3.2-2.5}$       <sup>3</sup> ESEN      10 BELL      Repl. by ESEN 13

$10.4^{+3.5}_{-3.2} \pm 1.1$       <sup>4</sup> AALTONEN      08F CDF      Repl. by AALTONEN 12C

<67      90      DRUTSKOY      07A BELL      Repl. by ESEN 10

<sup>1</sup> Use  $\Upsilon(5S) \rightarrow B_s^* \bar{B}_s^*$  decays assuming  $B(\Upsilon(5S) \rightarrow B_s^* \bar{B}_s^*) = (17.1 \pm 3.0)\%$  and  $\Gamma(\Upsilon(5S) \rightarrow B_s^* \bar{B}_s^*) / \Gamma(\Upsilon(5S) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (87.0 \pm 1.7)\%$ .

<sup>2</sup> AALTONEN 12C reports  $(f_s/f_d) (B(B_s^0 \rightarrow D_s^+ D_s^-) / B(B^0 \rightarrow D^- D_s^+)) = 0.183 \pm 0.021 \pm 0.017$ . We multiply this result by our best value of  $B(B^0 \rightarrow D^- D_s^+) = (7.2 \pm 0.8) \times 10^{-3}$  and divide by our best value of  $f_s/f_d$ , where  $1/2 f_s/f_d = 0.129 \pm 0.008$ . Our first quoted uncertainty is the combined experiment's uncertainty and our second is the systematic uncertainty from using out best values.

<sup>3</sup> Uses  $\Upsilon(10860) \rightarrow B_s^* \bar{B}_s^*$  assuming  $B(\Upsilon(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (19.3 \pm 2.9)\%$  and  $\Gamma(\Upsilon(10860) \rightarrow B_s^* \bar{B}_s^*) / \Gamma(\Upsilon(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (90.1^{+3.8}_{-4.0})\%$ .

<sup>4</sup> AALTONEN 08F reports  $[\Gamma(B_s^0 \rightarrow D_s^+ D_s^-) / \Gamma_{\text{total}}] / [B(B^0 \rightarrow D^- D_s^+)] = 1.44^{+0.48}_{-0.44}$  which we multiply by our best value  $B(B^0 \rightarrow D^- D_s^+) = (7.2 \pm 0.8) \times 10^{-3}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

### $\Gamma(D_s^{*-} \pi^+)/\Gamma_{\text{total}}$

VALUE (units $10^{-3}$ )	DOCUMENT ID	TECN	COMMENT	$\Gamma_{14}/\Gamma$
<b><math>2.0 \pm 0.5</math> OUR AVERAGE</b> $[(2.1 \pm 0.6) \times 10^{-3}$ OUR 2012 AVERAGE]				

**$2.0^{+0.5+0.1}_{-0.4-0.2}$**       <sup>1</sup> LOUVOT      10 BELL       $e^+ e^- \rightarrow \Upsilon(5S)$

<sup>1</sup> LOUVOT 10 reports  $[\Gamma(B_s^0 \rightarrow D_s^{*-} \pi^+)/\Gamma_{\text{total}}] / [B(B_s^0 \rightarrow D_s^- \pi^+)] = 0.65^{+0.15}_{-0.13} \pm 0.07$  which we multiply by our best value  $B(B_s^0 \rightarrow D_s^- \pi^+) = (3.04 \pm 0.23) \times 10^{-3}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

### $\Gamma(D_s^{*-} \rho^+)/\Gamma_{\text{total}}$

VALUE (units $10^{-3}$ )	DOCUMENT ID	TECN	COMMENT	$\Gamma_{15}/\Gamma$
<b><math>9.7 \pm 2.2</math> OUR AVERAGE</b> $[(10.3 \pm 2.6) \times 10^{-3}$ OUR 2012 AVERAGE]				

**$9.7 \pm 2.0^{+0.7}_{-0.8}$**       <sup>1</sup> LOUVOT      10 BELL       $e^+ e^- \rightarrow \Upsilon(5S)$

<sup>1</sup> LOUVOT 10 reports  $[\Gamma(B_s^0 \rightarrow D_s^{*-} \rho^+)/\Gamma_{\text{total}}] / [B(B_s^0 \rightarrow D_s^- \pi^+)] = 3.2 \pm 0.6 \pm 0.3$  which we multiply by our best value  $B(B_s^0 \rightarrow D_s^- \pi^+) = (3.04 \pm 0.23) \times 10^{-3}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

### $\Gamma(D_s^{*-} \rho^+)/\Gamma(D_s^- \rho^+)$

VALUE	DOCUMENT ID	TECN	COMMENT	$\Gamma_{15}/\Gamma_8$
<b><math>1.4 \pm 0.3 \pm 0.1</math></b>	LOUVOT	10 BELL	$e^+ e^- \rightarrow \Upsilon(5S)$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

$1.4 \pm 0.3 \pm 0.1$       LOUVOT      10 BELL       $e^+ e^- \rightarrow \Upsilon(5S)$

### $[\Gamma(D_s^{*+} D_s^-) + \Gamma(D_s^{*-} D_s^+)]/\Gamma_{\text{total}}$

VALUE (units $10^{-3}$ )	CL%	DOCUMENT ID	TECN	COMMENT	$\Gamma_{16}/\Gamma$
<b><math>13.0 \pm 2.2</math> OUR AVERAGE</b>	Error includes scale factor of 1.1.			$[(12.4 \pm 2.1) \times 10^{-3}$ OUR 2012 AVERAGE]	

**$13.0 \pm 2.2$  OUR AVERAGE** Error includes scale factor of 1.1.  $[(12.4 \pm 2.1) \times 10^{-3}$  OUR 2012 AVERAGE]

$17.6^{+2.3}_{-2.2} \pm 4.0$       <sup>1</sup> ESEN      13 BELL       $e^+ e^- \rightarrow \Upsilon(5S)$

$11.9 \pm 1.6 \pm 1.5$       <sup>2</sup> AALTONEN      12C CDF       $p\bar{p}$  at 1.96 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$27.5^{+8.3}_{-7.1} \pm 6.9$       <sup>3</sup> ESEN      10 BELL      Repl. by ESEN 13

<121      90      DRUTSKOY      07A BELL      Repl. by ESEN 10

<sup>1</sup> Use  $\Upsilon(5S) \rightarrow B_s^* \bar{B}_s^*$  decays assuming  $B(\Upsilon(5S) \rightarrow B_s^* \bar{B}_s^*) = (17.1 \pm 3.0)\%$  and  $\Gamma(\Upsilon(5S) \rightarrow B_s^* \bar{B}_s^*) / \Gamma(\Upsilon(5S) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (87.0 \pm 1.7)\%$ .

<sup>2</sup> AALTONEN 12C reports  $(f_s/f_d) (B(B_s^0 \rightarrow D_s^{*+} D_s^- + D_s^{*-} D_s^+) / B(B^0 \rightarrow D^- D_s^+)) = 0.424 \pm 0.046 \pm 0.035$ . We multiply this result by our best value of  $B(B^0 \rightarrow D^- D_s^+) = (7.2 \pm 0.8) \times 10^{-3}$  and divide by our best value of  $f_s/f_d$ , where

NODE=S086R32;LINKAGE=EN

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NODE=S086R32;LINKAGE=AA

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NEW

NODE=S086R33;LINKAGE=EN

NODE=S086R33;LINKAGE=AL

$1/2 f_s/f_d = 0.129 \pm 0.008$ . Our first quoted uncertainty is the combined experiment's uncertainty and our second is the systematic uncertainty from using out best values.

3 Uses  $\Upsilon(10860) \rightarrow B_s^* \bar{B}_s^*$  assuming  $B(\Upsilon(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (19.3 \pm 2.9)\%$  and  $\Gamma(\Upsilon(10860) \rightarrow B_s^* \bar{B}_s^*) / \Gamma(\Upsilon(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (90.1^{+3.8}_{-4.0})\%$ .

$\Gamma(D_s^{*+} D_s^{*-})/\Gamma_{\text{total}}$			$\Gamma_{17}/\Gamma$
VALUE (units $10^{-3}$ )	CL%	DOCUMENT ID	TECN COMMENT

**18.7 ± 3.0 OUR AVERAGE**  
[( $18.8 \pm 3.4$ )  $\times 10^{-3}$  OUR 2012 AVERAGE]

$19.8^{+3.3+5.2}_{-3.1-5.0}$       1 ESEN      13 BELL       $e^+ e^- \rightarrow \Upsilon(5S)$

$18.3 \pm 2.7 \pm 2.3$       2 AALTONEN      12C CDF       $p\bar{p}$  at 1.96 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$30.8^{+12.2+8.5}_{-10.4-8.6}$       3 ESEN      10 BELL      Repl. by ESEN 13

<257      90 DRUTSKOY      07A BELL      Repl. by ESEN 10

1 Use  $\Upsilon(5S) \rightarrow B_s^* \bar{B}_s^*$  decays assuming  $B(\Upsilon(5S) \rightarrow B_s^* \bar{B}_s^*) = (17.1 \pm 3.0)\%$  and  $\Gamma(\Upsilon(5S) \rightarrow B_s^* \bar{B}_s^*) / \Gamma(\Upsilon(5S) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (87.0 \pm 1.7)\%$ .

2 AALTONEN 12C reports  $(f_s/f_d) (B(B_s^0 \rightarrow D_s^{*+} D_s^{*-}) / B(B_s^0 \rightarrow D^- D_s^+)) = 0.654 \pm 0.072 \pm 0.065$ . We multiply this result by our best value of  $B(B_s^0 \rightarrow D^- D_s^+) = (7.2 \pm 0.8) \times 10^{-3}$  and divide by our best value of  $f_s/f_d$ , where  $1/2 f_s/f_d = 0.129 \pm 0.008$ . Our first quoted uncertainty is the combined experiment's uncertainty and our second is the systematic uncertainty from using out best values.

3 Uses  $\Upsilon(10860) \rightarrow B_s^* \bar{B}_s^*$  assuming  $B(\Upsilon(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (19.3 \pm 2.9)\%$  and  $\Gamma(\Upsilon(10860) \rightarrow B_s^* \bar{B}_s^*) / \Gamma(\Upsilon(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (90.1^{+3.8}_{-4.0})\%$ .

$\Gamma(D_s^{(*)+} D_s^{(*)-})/\Gamma_{\text{total}}$		$\Gamma_{18}/\Gamma$	
VALUE (%)	CL%	DOCUMENT ID	TECN COMMENT

**4.5 ± 1.4 OUR EVALUATION**

**3.7 ± 0.5 OUR AVERAGE**

[( $3.7 \pm 0.6$ )% OUR 2012 AVERAGE]

$4.32^{+0.42+1.04}_{-0.39-1.03}$       1 ESEN      13 BELL       $e^+ e^- \rightarrow \Upsilon(5S)$

$3.5 \pm 0.4 \pm 0.4$       2 AALTONEN      12C CDF       $p\bar{p}$  at 1.96 TeV

$3.5 \pm 1.0 \pm 1.1$       3 ABAZOV      09I D0       $p\bar{p}$  at 1.96 TeV

$14 \pm 6 \pm 3$       4,5 BARATE      00K ALEP       $e^+ e^- \rightarrow Z$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$6.85^{+1.53+1.79}_{-1.30-1.80}$       6,7 ESEN      10 BELL      Repl. by ESEN 13

$3.9^{+1.9+1.6}_{-1.7-1.5}$       3 ABAZOV      07Y D0      Repl. by ABAZOV 09I

<0.218      90 BARATE      98Q ALEP       $e^+ e^- \rightarrow Z$

1 Use  $\Upsilon(5S) \rightarrow B_s^* \bar{B}_s^*$  decays assuming  $B(\Upsilon(5S) \rightarrow B_s^* \bar{B}_s^*) = (17.1 \pm 3.0)\%$  and  $\Gamma(\Upsilon(5S) \rightarrow B_s^* \bar{B}_s^*) / \Gamma(\Upsilon(5S) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (87.0 \pm 1.7)\%$ .

2 AALTONEN 12C reports  $(f_s/f_d) (B(B_s^0 \rightarrow D_s^{(*)+} D_s^{(*)-}) / B(B_s^0 \rightarrow D^- D_s^+)) = 1.261 \pm 0.095 \pm 0.112$ . We multiply this result by our best value of  $B(B_s^0 \rightarrow D^- D_s^+) = (7.2 \pm 0.8) \times 10^{-3}$  and divide by our best value of  $f_s/f_d$ , where  $1/2 f_s/f_d = 0.129 \pm 0.008$ . Our first quoted uncertainty is the combined experiment's uncertainty and our second is the systematic uncertainty from using out best values.

3 Uses the final states where  $D_s^+ \rightarrow \phi \pi^+$  and  $D_s^- \rightarrow \phi \mu^- \bar{\nu}_\mu$ .

4 Reports  $B(B_s^0(\text{short}) \rightarrow D_s^{(*)} D_s^{(*)}) = (0.23 \pm 0.10 \pm 0.05) \cdot [0.17/B(D_s \rightarrow \phi \chi)]^2$  assuming  $B(B_s^0 \rightarrow B_s^0(\text{short})) = 50\%$ . We use our best value of  $B(D_s \rightarrow \phi \chi) = 15.7 \pm 1.0\%$  to obtain the quoted result.

5 Uses  $\phi \phi$  correlations from  $B_s^0(\text{short}) \rightarrow D_s^{(*)+} D_s^{(*)-}$ .

6 Sum of exclusive  $B_s \rightarrow D_s^+ D_s^-$ ,  $B_s \rightarrow D_s^{*\pm} D_s^{\mp}$  and  $B_s \rightarrow D_s^{*+} D_s^{*-}$ .

7 Uses  $\Upsilon(10860) \rightarrow B_s^* \bar{B}_s^*$  assuming  $B(\Upsilon(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (19.3 \pm 2.9)\%$  and  $\Gamma(\Upsilon(10860) \rightarrow B_s^* \bar{B}_s^*) / \Gamma(\Upsilon(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (90.1^{+3.8}_{-4.0})\%$ .

NODE=S086R33;LINKAGE=ES

NODE=S086R34  
NODE=S086R34

NEW

NODE=S086R34;LINKAGE=EN

NODE=S086R34;LINKAGE=AL

NODE=S086R34;LINKAGE=ES

NODE=S086R23  
NODE=S086R23

NODE=S086R23  
→ UNCHECKED ←  
NEW

NODE=S086R23;LINKAGE=EN

NODE=S086R23;LINKAGE=AL

NODE=S086R23;LINKAGE=AB  
NODE=S086R23;LINKAGE=BA

NODE=S086R23;LINKAGE=KB  
NODE=S086R23;LINKAGE=EE  
NODE=S086R23;LINKAGE=ES

$\Gamma(\bar{D}^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}$	$\Gamma_{19}/\Gamma$
<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<b><math>4.7 \pm 1.2 \pm 0.7</math></b>	1 AAIJ 11D LHCb $p\bar{p}$ at 7 TeV 1 AAIJ 11D reports $[\Gamma(B_s^0 \rightarrow \bar{D}^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}] / [B(B_s^0 \rightarrow \bar{D}^0 \rho^0)] = 1.48 \pm 0.34 \pm 0.19$ which we multiply by our best value $B(B_s^0 \rightarrow \bar{D}^0 \rho^0) = (3.2 \pm 0.5) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S086R52  
NODE=S086R52

NODE=S086R52;LINKAGE=AA

$\Gamma(\bar{D}^0 K^+ K^-)/\Gamma_{\text{total}}$	$\Gamma_{20}/\Gamma$
<u>VALUE (units <math>10^{-5}</math>)</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<b><math>4.2 \pm 1.6 \pm 1.1</math></b>	1,2 AAIJ 12AM LHCb $p\bar{p}$ at 7 TeV 1 AAIJ 12AM reports $[\Gamma(B_s^0 \rightarrow \bar{D}^0 K^+ K^-)/\Gamma_{\text{total}}] / [B(B_s^0 \rightarrow \bar{D}^0 K^+ K^-)] = 0.90 \pm 0.27 \pm 0.20$ which we multiply by our best value $B(B_s^0 \rightarrow \bar{D}^0 K^+ K^-) = (4.7 \pm 1.2) \times 10^{-5}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value. 2 Uses $B(b \rightarrow B_s^0)/B(b \rightarrow B^0) = 0.267^{+0.023}_{-0.020}$ measured by the same authors.

NODE=S086R03  
NODE=S086R03

NODE=S086R03;LINKAGE=AA

NODE=S086R03;LINKAGE=AI

NODE=S086R6  
NODE=S086R6

NEW

$\Gamma(J/\psi(1S)\phi)/\Gamma_{\text{total}}$	$\Gamma_{21}/\Gamma$
<u>VALUE (units <math>10^{-3}</math>)</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<b><math>1.00^{+0.32}_{-0.18}</math> OUR FIT</b>	
$[(1.09^{+0.28}_{-0.23}) \times 10^{-3}$ OUR 2012 FIT]	
<b><math>1.4 \pm 0.5 \pm 0.1</math></b>	1 ABE 96Q CDF $p\bar{p}$ • • • We do not use the following data for averages, fits, limits, etc. • • •
<6	1 AKERS 94J OPAL $e^+ e^- \rightarrow Z$
seen	14 ABE 93F CDF $p\bar{p}$ at 1.8 TeV
seen	1 ACTON 92N OPAL Sup. by AKERS 94J
1 ABE 96Q reports $[\Gamma(B_s^0 \rightarrow J/\psi(1S)\phi)/\Gamma_{\text{total}}] \times [\Gamma(\bar{b} \rightarrow B_s^0)/[\Gamma(\bar{b} \rightarrow B^+) + \Gamma(\bar{b} \rightarrow B^0)] = (0.185 \pm 0.055 \pm 0.020) \times 10^{-3}$ which we divide by our best value $\Gamma(\bar{b} \rightarrow B_s^0)/[\Gamma(\bar{b} \rightarrow B^+) + \Gamma(\bar{b} \rightarrow B^0)] = 0.129 \pm 0.008$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.	
2 AKERS 94J sees one event and measures the limit on the product branching fraction $f(\bar{b} \rightarrow B_s^0) \cdot B(B_s^0 \rightarrow J/\psi(1S)\phi) < 7 \times 10^{-4}$ at CL = 90%. We divide by $B(\bar{b} \rightarrow B_s^0) = 0.112$ .	
3 ABE 93F measured using $J/\psi(1S) \rightarrow \mu^+ \mu^-$ and $\phi \rightarrow K^+ K^-$ .	
4 In ACTON 92N a limit on the product branching fraction is measured to be $f(\bar{b} \rightarrow B_s^0) \cdot B(B_s^0 \rightarrow J/\psi(1S)\phi) \leq 0.22 \times 10^{-2}$ .	

NODE=S086R6;LINKAGE=BE

NODE=S086R6;LINKAGE=B

NODE=S086R6;LINKAGE=A  
NODE=S086R6;LINKAGE=AA

NODE=S086R19  
NODE=S086R19

NODE=S086R19;LINKAGE=CQ

NODE=S086R20  
NODE=S086R20

NEW

$\Gamma(J/\psi(1S)\pi^0)/\Gamma_{\text{total}}$	$\Gamma_{22}/\Gamma$
<u>VALUE</u> <u>CL%</u>	<u>DOCUMENT ID</u> <u>TECN</u>
<b><math>&lt;1.2 \times 10^{-3}</math></b>	90 1 ACCIARRI 97C L3

1 ACCIARRI 97C assumes  $B^0$  production fraction  $(39.5 \pm 4.0\%)$  and  $B_s$   $(12.0 \pm 3.0\%)$ .

$\Gamma(J/\psi(1S)\eta)/\Gamma_{\text{total}}$	$\Gamma_{23}/\Gamma$
<u>VALUE (units <math>10^{-4}</math>)</u>	<u>CL%</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<b><math>4.0 \pm 0.7</math> OUR AVERAGE</b>	Error includes scale factor of 1.3. $[(5.1^{+1.3}_{-1.0}) \times 10^{-4}$ OUR 2012 AVERAGE]

NODE=S086R19;LINKAGE=CQ

NODE=S086R20  
NODE=S086R20

NEW

$3.6^{+0.5}_{-0.6} \pm 0.3$	1 AAIJ 13A LHCb $p\bar{p}$ at 7 TeV
$5.10 \pm 0.50^{+1.17}_{-0.83}$	2 LI 12 BELL $e^+ e^- \rightarrow \gamma(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •	
<38	90 3 ACCIARRI 97C L3
1 AAIJ 13A reports $[\Gamma(B_s^0 \rightarrow J/\psi(1S)\eta)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow J/\psi(1S)\rho^0)] = 14.0 \pm 1.2^{+1.1+1.1}_{-1.5-1.0}$ which we multiply by our best value $B(B^0 \rightarrow J/\psi(1S)\rho^0) = (2.58 \pm 0.21) \times 10^{-5}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.	
2 Observed for the first time with significances over $10\sigma$ . The second error are total systematic uncertainties including the error on $N(B_s^{(*)}\bar{B}_s^{(*)})$ .	
3 ACCIARRI 97C assumes $B^0$ production fraction $(39.5 \pm 4.0\%)$ and $B_s$ $(12.0 \pm 3.0\%)$ .	

NODE=S086R20;LINKAGE=AA

NODE=S086R20;LINKAGE=LI

NODE=S086R20;LINKAGE=CQ

$\Gamma(J/\psi(1S)K_S^0)/\Gamma_{\text{total}}$ VALUE (units  $10^{-5}$ )**2.1 ± 0.6 OUR AVERAGE** Error includes scale factor of 2.1.  $[(3.6 \pm 0.8) \times 10^{-5}$  OUR 2012 AVERAGE] $1.89 \pm 0.24 \pm 0.14$  $3.7 \pm 0.7 \pm 0.3$ 

DOCUMENT ID

TECN

COMMENT

<sup>1</sup> AAIJ 120 LHCb  $p\bar{p}$  at 7 TeV  
<sup>2</sup> AALTONEN 11A CDF  $p\bar{p}$  at 1.96 TeV $\Gamma_{24}/\Gamma$ 

NODE=S086R46

NODE=S086R46

NEW

NODE=S086R46;LINKAGE=AI

<sup>1</sup> AAIJ 120 reports  $(1.83 \pm 0.21 \pm 0.10 \pm 0.14 \pm 0.07) \times 10^{-5}$  from a measurement of  $[\Gamma(B_s^0 \rightarrow J/\psi(1S)K_S^0)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow J/\psi(1S)K^0)] \times [\Gamma(\bar{b} \rightarrow B_s^0)/\Gamma(\bar{b} \rightarrow B^0)]$  assuming  $B(B^0 \rightarrow J/\psi(1S)K^0) = (8.71 \pm 0.32) \times 10^{-4}$ ,  $\Gamma(\bar{b} \rightarrow B_s^0)/\Gamma(\bar{b} \rightarrow B^0) = 0.267^{+0.021}_{-0.02}$ , which we rescale to our best values  $B(B^0 \rightarrow J/\psi(1S)K^0) = (8.73 \pm 0.32) \times 10^{-4}$ ,  $\Gamma(\bar{b} \rightarrow B_s^0)/\Gamma(\bar{b} \rightarrow B^0) = 0.259 \pm 0.016$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

<sup>2</sup> AALTONEN 11A reports  $[\Gamma(B_s^0 \rightarrow J/\psi(1S)K_S^0)/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow B_s^0)] / [B(B^0 \rightarrow J/\psi(1S)K^0)] = 0.0109 \pm 0.0019 \pm 0.0011$  which we multiply or divide by our best values  $B(\bar{b} \rightarrow B_s^0) = (10.4 \pm 0.6) \times 10^{-2}$ ,  $B(\bar{b} \rightarrow B^0) = (40.2 \pm 0.7) \times 10^{-2}$ ,  $B(B^0 \rightarrow J/\psi(1S)K^0) = (8.73 \pm 0.32) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

 $\Gamma(J/\psi(1S)K^*(892)^0)/\Gamma_{\text{total}}$ VALUE (units  $10^{-5}$ )**4.4±0.9 OUR AVERAGE**  $[(9 \pm 4) \times 10^{-5}$  OUR 2012 AVERAGE]**4.4<sup>+0.5</sup><sub>-0.4</sub>±0.8**

DOCUMENT ID

TECN

COMMENT

<sup>1</sup> AAIJ 12AP LHCb  $p\bar{p}$  at 7 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

 $9 \pm 4 \pm 1$ <sup>2</sup> AALTONEN 11A CDF  $p\bar{p}$  at 1.96 TeV

<sup>1</sup> AAIJ 12AP reports  $B(B_s^0 \rightarrow J/\psi(1S)K^*(892)^0)/B(B^0 \rightarrow J/\psi(1S)K^*(892)^0) = (3.43^{+0.34}_{-0.36} \pm 0.50) \times 10^{-2}$  and  $B(B^0 \rightarrow J/\psi(1S)K^*(892)^0) = (1.29 \pm 0.05 \pm 0.13) \times 10^{-3}$  after correcting for the contribution from  $K\pi$  S-wave beneath the  $K^*$  peak.

<sup>2</sup> AALTONEN 11A reports  $[\Gamma(B_s^0 \rightarrow J/\psi(1S)K^*(892)^0)/\Gamma_{\text{total}}] \times [B(\bar{b} \rightarrow B_s^0)] / [B(B^0 \rightarrow J/\psi(1S)K^*(892)^0)] = 0.0168 \pm 0.0024 \pm 0.0068$  which we multiply or divide by our best values  $B(\bar{b} \rightarrow B_s^0) = (10.4 \pm 0.6) \times 10^{-2}$ ,  $B(\bar{b} \rightarrow B^0) = (40.2 \pm 0.7) \times 10^{-2}$ ,  $B(B^0 \rightarrow J/\psi(1S)K^*(892)^0) = (1.34 \pm 0.06) \times 10^{-3}$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

 $\Gamma_{25}/\Gamma$ 

NODE=S086R47

NODE=S086R47

NEW

NODE=S086R47;LINKAGE=AI

 $\Gamma(J/\psi(1S)\eta')/\Gamma_{\text{total}}$ VALUE (units  $10^{-4}$ )**3.4 ± 0.5 OUR AVERAGE** $[(3.7^{+1.0}_{-0.9}) \times 10^{-4}$  OUR 2012 AVERAGE] $3.3^{+0.4}_{-0.5} \pm 0.3$  $3.71 \pm 0.61^{+0.85}_{-0.60}$ 

DOCUMENT ID

TECN

COMMENT

<sup>1</sup> AAIJ 13A LHCb  $p\bar{p}$  at 7 TeV<sup>2</sup> LI 12 BELL  $e^+e^- \rightarrow \gamma(4S)$  $\Gamma_{26}/\Gamma$ 

NODE=S086R01

NODE=S086R01

NEW

NODE=S086R01;LINKAGE=AA

 $\Gamma(J/\psi(1S)\eta')/\Gamma(J/\psi(1S)\eta)$ 

VALUE

DOCUMENT ID

TECN

COMMENT

**0.85<sup>+0.09</sup><sub>-0.08</sub> OUR AVERAGE** $[0.73 \pm 0.14$  OUR 2012 AVERAGE] $0.90 \pm 0.09^{+0.06}_{-0.02}$  $0.73 \pm 0.14 \pm 0.02$ <sup>1</sup> AAIJ 13A LHCb  $p\bar{p}$  at 7 TeV<sup>1</sup> LI 12 BELL  $e^+e^- \rightarrow \gamma(4S)$  $\Gamma_{26}/\Gamma_{23}$ 

NODE=S086R02

NODE=S086R02

NEW

NODE=S086R02;LINKAGE=SC

<sup>1</sup> Strongly correlated with measurements of  $\Gamma(J/\psi(1S)\eta)/\Gamma$  and  $\Gamma(J/\psi(1S)\eta')/\Gamma$  reported in the same reference.

$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma(J/\psi(1S)\phi)$ 

<u>VALUE</u> (units $10^{-2}$ )	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_{27}/\Gamma_{21}$
<b>19.8±0.5±0.5</b>	1 AAIJ	12AO LHCb	$p p$ at 7 TeV	
1 AAIJ 12AO reports $(19.79 \pm 0.47 \pm 0.52) \times 10^{-2}$ from a measurement of $[\Gamma(B_s^0 \rightarrow J/\psi(1S)\pi^+\pi^-)/\Gamma(B_s^0 \rightarrow J/\psi(1S)\phi)] / [B(\phi(1020) \rightarrow K^+K^-)]$ assuming $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$ .				

 $\Gamma(J/\psi(1S)f_0(980), f_0 \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}$ 

<u>VALUE</u> (units $10^{-4}$ )	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_{28}/\Gamma$
<b>1.29<sup>+0.40</sup><sub>-0.23</sub> OUR FIT</b> [(1.36 <sup>+0.35</sup> <sub>-0.28</sub> ) $\times 10^{-4}$ OUR 2012 FIT]				
<b>1.16<sup>+0.31+0.30</sup><sub>-0.19-0.25</sub></b>	1 L1	11 BELL	$e^+e^- \rightarrow \gamma(5S)$	

<sup>1</sup> The second error includes both the detector systematic and the uncertainty in the number of produced  $\gamma(5S) \rightarrow B_s^{(*)}\bar{B}_s^{(*)}$  pairs.

 $\Gamma(J/\psi(1S)f_0(980), f_0 \rightarrow \pi^+\pi^-)/\Gamma(J/\psi(1S)\phi)$ 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_{28}/\Gamma_{21}$
<b>0.130±0.009 OUR FIT</b> [0.125 ± 0.010 OUR 2012 FIT]				

**0.130<sup>+0.010</sup><sub>-0.008</sub> OUR AVERAGE**

[0.126 ± 0.010 OUR 2012 AVERAGE]

0.139±0.006 <sup>+0.025</sup> <sub>-0.012</sub>	1,2 AAIJ	12AO LHCb	$p p$ at 7 TeV	
0.135±0.036±0.001	3 ABAZOV	12C D0	$p\bar{p}$ at 1.96 TeV	
0.123 <sup>+0.026</sup> <sub>-0.022</sub> ±0.001	4 AAIJ	11 LHCb	$p p$ at 7 TeV	
0.126±0.012±0.001	5 AALTONEN	11AB CDF	$p\bar{p}$ at 1.96 TeV	

<sup>1</sup> AAIJ 12AO reports  $(13.9 \pm 0.6^{+2.5}_{-1.2}) \times 10^{-2}$  from a measurement of  $[\Gamma(B_s^0 \rightarrow J/\psi(1S)f_0(980), f_0 \rightarrow \pi^+\pi^-)/\Gamma(B_s^0 \rightarrow J/\psi(1S)\phi)] / [B(\phi(1020) \rightarrow K^+K^-)]$  assuming  $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$ .

<sup>2</sup> Measured in Dalitz plot like analysis of  $B_s \rightarrow J/\psi\pi^+\pi^-$  decays.

<sup>3</sup> ABABOV 12C reports  $[\Gamma(B_s^0 \rightarrow J/\psi(1S)f_0(980), f_0 \rightarrow \pi^+\pi^-)/\Gamma(B_s^0 \rightarrow J/\psi(1S)\phi)] / [B(\phi(1020) \rightarrow K^+K^-)] = 0.275 \pm 0.041 \pm 0.061$  which we multiply by our best value  $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>4</sup> AAIJ 11 reports  $[\Gamma(B_s^0 \rightarrow J/\psi(1S)f_0(980), f_0 \rightarrow \pi^+\pi^-)/\Gamma(B_s^0 \rightarrow J/\psi(1S)\phi)] / [B(\phi(1020) \rightarrow K^+K^-)] = 0.252^{+0.046+0.027}_{-0.032-0.033}$  which we multiply by our best value  $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>5</sup> AALTONEN 11AB reports  $[\Gamma(B_s^0 \rightarrow J/\psi(1S)f_0(980), f_0 \rightarrow \pi^+\pi^-)/\Gamma(B_s^0 \rightarrow J/\psi(1S)\phi)] / [B(\phi(1020) \rightarrow K^+K^-)] = 0.257 \pm 0.020 \pm 0.014$  which we multiply by our best value  $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(J/\psi(1S)f_0(1370), f_0 \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}$ 

<u>VALUE</u> (units $10^{-4}$ )	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_{29}/\Gamma$
<b>0.39<sup>+0.09</sup><sub>-0.17</sub> OUR FIT</b>				

<b>0.34<sup>+0.11+0.085</sup><sub>-0.14-0.054</sub></b>	1 L1	11 BELL	$e^+e^- \rightarrow \gamma(5S)$
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<sup>1</sup> The second error includes both the detector systematic and the uncertainty in the number of produced  $\gamma(5S) \rightarrow B_s^{(*)}\bar{B}_s^{(*)}$  pairs.

 $\Gamma(J/\psi(1S)f_0(1370), f_0 \rightarrow \pi^+\pi^-)/\Gamma(J/\psi(1S)\phi)$ 

<u>VALUE</u> (units $10^{-2}$ )	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_{29}/\Gamma_{21}$
<b>3.9<sup>+0.6</sup><sub>-2.0</sub> OUR FIT</b>				

<b>4.2<sup>+0.5+0.1</sup><sub>-3.7</sub></b>	1,2 AAIJ	12AO LHCb	$p p$ at 7 TeV
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NODE=S086R04  
NODE=S086R04

NODE=S086R04;LINKAGE=AA

NODE=S086R44  
NODE=S086R44

NEW

NODE=S086R44;LINKAGE=LI

NODE=S086R53  
NODE=S086R53  
NEW

NEW

NODE=S086R53;LINKAGE=AJ

NODE=S086R53;LINKAGE=DA  
NODE=S086R53;LINKAGE=AB

NODE=S086R53;LINKAGE=AI

NODE=S086R53;LINKAGE=AA

NODE=S086R45  
NODE=S086R45

NODE=S086R45;LINKAGE=LI

NODE=S086R07  
NODE=S086R07

<sup>1</sup> AAIJ 12AO reports  $(4.19 \pm 0.53^{+0.12}_{-3.7}) \times 10^{-2}$  from a measurement of  $[\Gamma(B_s^0 \rightarrow J/\psi(1S) f_0(1370), f_0 \rightarrow \pi^+ \pi^-)/\Gamma(B_s^0 \rightarrow J/\psi(1S)\phi)] / [B(\phi(1020) \rightarrow K^+ K^-)]$  assuming  $B(\phi(1020) \rightarrow K^+ K^-) = (48.9 \pm 0.5) \times 10^{-2}$ .

<sup>2</sup> Measured in Dalitz plot like analysis of  $B_s \rightarrow J/\psi \pi^+ \pi^-$  decays.

### $\Gamma(J/\psi(1S)f_2(1270), f_2 \rightarrow \pi^+ \pi^-)/\Gamma(J/\psi(1S)\phi)$ $\Gamma_{30}/\Gamma_{21}$

VALUE (units $10^{-4}$ )	DOCUMENT ID	TECN	COMMENT
<b><math>9.8 \pm 3.3^{+0.6}_{-1.5}</math></b>	1,2 AAIJ	12AO LHCb	$p\bar{p}$ at 7 TeV

<sup>1</sup> AAIJ 12AO reports  $(0.098 \pm 0.033^{+0.006}_{-0.015}) \times 10^{-2}$  from a measurement of  $[\Gamma(B_s^0 \rightarrow J/\psi(1S)f_2(1270), f_2 \rightarrow \pi^+ \pi^-)/\Gamma(B_s^0 \rightarrow J/\psi(1S)\phi)] / [B(\phi(1020) \rightarrow K^+ K^-)]$  assuming  $B(\phi(1020) \rightarrow K^+ K^-) = (48.9 \pm 0.5) \times 10^{-2}$ .

<sup>2</sup> Measured in Dalitz plot like analysis of  $B_s \rightarrow J/\psi \pi^+ \pi^-$  decays for the  $f_2$  helicity state  $\lambda = 0$ .

### $\Gamma(J/\psi(1S)\pi^+ \pi^- (\text{nonresonant}))/\Gamma(J/\psi(1S)\phi)$ $\Gamma_{31}/\Gamma_{21}$

VALUE (units $10^{-2}$ )	DOCUMENT ID	TECN	COMMENT
<b><math>1.66 \pm 0.31^{+0.96}_{-0.08}</math></b>	1,2 AAIJ	12AO LHCb	$p\bar{p}$ at 7 TeV

<sup>1</sup> AAIJ 12AO reports  $(1.66 \pm 0.31^{+0.96}_{-0.08}) \times 10^{-2}$  from a measurement of  $[\Gamma(B_s^0 \rightarrow J/\psi(1S)\pi^+ \pi^- (\text{nonresonant}))/\Gamma(B_s^0 \rightarrow J/\psi(1S)\phi)] / [B(\phi(1020) \rightarrow K^+ K^-)]$  assuming  $B(\phi(1020) \rightarrow K^+ K^-) = (48.9 \pm 0.5) \times 10^{-2}$ .

<sup>2</sup> Measured in Dalitz plot like analysis of  $B_s \rightarrow J/\psi \pi^+ \pi^-$  decays.

### $\Gamma(J/\psi(1S)f'_2(1525))/\Gamma(J/\psi(1S)\phi)$ $\Gamma_{32}/\Gamma_{21}$

VALUE (units $10^{-2}$ )	DOCUMENT ID	TECN	COMMENT
<b><math>26.4 \pm 3.5 \pm 0.7</math></b>	1 AAIJ	12S LHCb	$p\bar{p}$ at 7 TeV

<sup>1</sup> AAIJ 12S reports  $[(26.4 \pm 2.7 \pm 2.4) \times 10^{-2}$  from a measurement of  $\Gamma(B_s^0 \rightarrow J/\psi(1S)f'_2(1525))/\Gamma(B_s^0 \rightarrow J/\psi(1S)\phi)] \times B(f'_2(1525) \rightarrow K^+ K^-) / B(\phi(1020) \rightarrow K^+ K^-)$  assuming  $B(f'_2(1525) \rightarrow K^+ K^-) = (44.4 \pm 1.1) \times 10^{-2}$ ,  $B(\phi(1020) \rightarrow K^+ K^-) = (48.9 \pm 0.5) \times 10^{-2}$ , which we rescale to our best values  $B(f'_2(1525) \rightarrow K^+ K^-) = \frac{1}{2} (88.7 \pm 2.2) \times 10^{-2}$ ,  $B(\phi(1020) \rightarrow K^+ K^-) = (48.9 \pm 0.5) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

### $\Gamma(\psi(2S)f'_2(1525))/\Gamma(J/\psi(1S)\phi)$ $\Gamma_{33}/\Gamma_{21}$

VALUE	DOCUMENT ID	TECN	COMMENT
<b><math>0.21 \pm 0.07 \pm 0.01</math></b>	1,2 ABAZOV	12AF D0	$p\bar{p}$ at 1.96 TeV

<sup>1</sup> ABAZOV 12AF reports  $[\Gamma(B_s^0 \rightarrow \psi(2S)f'_2(1525))/\Gamma(B_s^0 \rightarrow J/\psi(1S)\phi)] \times B(f'_2(1525) \rightarrow K^+ K^-) / B(\phi(1020) \rightarrow K^+ K^-) = 0.19 \pm 0.05 \pm 0.04$  which we divide and multiply by our best values  $B(f'_2(1525) \rightarrow K^+ K^-) = \frac{1}{2} (88.7 \pm 2.2) \times 10^{-2}$ ,  $B(\phi(1020) \rightarrow K^+ K^-) = (48.9 \pm 0.5) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

<sup>2</sup> ABAZOV 12AF fits the invariant masses of the  $K^+ K^-$  pair in the range  $1.35 < M(K^+ K^-) < 2$  GeV.

### $\Gamma(\psi(2S)\phi)/\Gamma_{\text{total}}$ $\Gamma_{34}/\Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				

seen 1 BUSKULIC 93G ALEP  $e^+ e^- \rightarrow Z$

### $\Gamma(\psi(2S)\phi)/\Gamma(J/\psi(1S)\phi)$ $\Gamma_{34}/\Gamma_{21}$

VALUE	DOCUMENT ID	TECN	COMMENT
<b><math>0.499 \pm 0.034</math> OUR AVERAGE</b>			
[ $0.53 \pm 0.10$ OUR 2012 AVERAGE]			
0.496 $\pm 0.034 \pm 0.012$	1,2 AAIJ	12L LHCb	$p\bar{p}$ at 7 TeV
0.53 $\pm 0.10 \pm 0.09$	ABAZOV	09Y D0	$p\bar{p}$ at 1.96 TeV
0.52 $\pm 0.13 \pm 0.07$	ABULENCIA	06N CDF	$p\bar{p}$ at 1.96 TeV

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NEW

<sup>1</sup> AAIJ 12L reports  $0.489 \pm 0.026 \pm 0.021 \pm 0.012$  from a measurement of  $[\Gamma(B_s^0 \rightarrow \psi(2S)\phi)/\Gamma(B_s^0 \rightarrow J/\psi(1S)\phi)] \times [B(J/\psi(1S) \rightarrow e^+e^-)] / [B(\psi(2S) \rightarrow e^+e^-)]$  assuming  $B(J/\psi(1S) \rightarrow e^+e^-) = (5.94 \pm 0.06) \times 10^{-2}$ ,  $B(\psi(2S) \rightarrow e^+e^-) = (7.72 \pm 0.17) \times 10^{-3}$ , which we rescale to our best values  $B(J/\psi(1S) \rightarrow e^+e^-) = (5.94 \pm 0.06) \times 10^{-2}$ ,  $B(\psi(2S) \rightarrow e^+e^-) = (7.82 \pm 0.17) \times 10^{-3}$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

<sup>2</sup> Assumes  $B(J/\psi \rightarrow \mu^+\mu^-) / B(\psi(2S) \rightarrow \mu^+\mu^-) = B(J/\psi \rightarrow e^+e^-) / B(\psi(2S) \rightarrow e^+e^-) = 7.69 \pm 0.19$ .

### $\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE (units $10^{-6}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>0.76±0.19 OUR AVERAGE</b>				Error includes scale factor of 1.4.

<sup>1</sup> AAIJ 12AR LHCb  $pp$  at 7 TeV  
<sup>2</sup> AALTONEN 12L CDF  $p\bar{p}$  at 1.96 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 12	90	<sup>3</sup> PENG	10	BELL $e^+e^- \rightarrow \gamma(5S)$
< 1.2	90	<sup>4</sup> AALTONEN	09C	CDF Repl. by AALTONEN 12L
< 1.7	90	<sup>5</sup> ABULENCIA,A	06D	CDF Repl. by AALTONEN 09C
< 232	90	<sup>6</sup> ABE	00C	SLD $e^+e^- \rightarrow Z$
< 170	90	<sup>7</sup> BUSKULIC	96V	ALEP $e^+e^- \rightarrow Z$

<sup>1</sup> AAIJ 12AR reports  $[\Gamma(B_s^0 \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow \pi^+\pi^-)] \times [\Gamma(\bar{b} \rightarrow B_s^0) / \Gamma(\bar{b} \rightarrow B^0)] = 0.050^{+0.011}_{-0.009} \pm 0.004$  which we multiply or divide by our best values  $B(B^0 \rightarrow \pi^+\pi^-) = (5.12 \pm 0.19) \times 10^{-6}$ ,  $\Gamma(\bar{b} \rightarrow B_s^0)/\Gamma(\bar{b} \rightarrow B^0) = 0.259 \pm 0.016$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

<sup>2</sup> AALTONEN 12L reports  $[\Gamma(B_s^0 \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow K^+\pi^-)] \times [\Gamma(\bar{b} \rightarrow B_s^0)/\Gamma(\bar{b} \rightarrow B^0)] = 0.008 \pm 0.002 \pm 0.001$  which we multiply or divide by our best values  $B(B^0 \rightarrow K^+\pi^-) = (1.96 \pm 0.05) \times 10^{-5}$ ,  $\Gamma(\bar{b} \rightarrow B_s^0)/\Gamma(\bar{b} \rightarrow B^0) = 0.259 \pm 0.016$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

<sup>3</sup> Uses  $\gamma(10860) \rightarrow B_s^* \bar{B}_s^*$  and assumes  $B(\gamma(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (19.3 \pm 2.9)\%$  and  $\Gamma(\gamma(10860) \rightarrow B_s^* \bar{B}_s^*) / \Gamma(\gamma(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (90.1^{+3.8}_{-4.0})\%$ .

<sup>4</sup> Obtains this result from  $(f_s/f_d) \cdot B(B_s \rightarrow \pi^+\pi^-)/B(B^0 \rightarrow K^+\pi^-) = 0.007 \pm 0.004 \pm 0.005$ , assuming  $f_s/f_d = 0.276 \pm 0.034$  and  $B(B^0 \rightarrow K^+\pi^-) = (19.4 \pm 0.6) \times 10^{-6}$ .

<sup>5</sup> ABULENCIA,A 06D obtains this from  $B(B_s \rightarrow \pi^+\pi^-) / B(B_s \rightarrow K^+K^-) < 0.05$  at 90% CL, assuming  $B(B_s \rightarrow K^+K^-) = (33 \pm 6 \pm 7) \times 10^{-6}$ .

<sup>6</sup> ABE 00C assumes  $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$  and the  $B$  fractions  $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$  and  $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$ .

<sup>7</sup> BUSKULIC 96V assumes PDG 96 production fractions for  $B^0$ ,  $B^+$ ,  $B_s$ ,  $b$  baryons.

### $\Gamma(\pi^0\pi^0)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt;2.1 \times 10^{-4}</math></b>	90	<sup>1</sup> ACCIARRI	95H L3	$e^+e^- \rightarrow Z$

<sup>1</sup> ACCIARRI 95H assumes  $f_{B^0} = 39.5 \pm 4.0$  and  $f_{B_s} = 12.0 \pm 3.0\%$ .

### $\Gamma(\eta\pi^0)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt;1.0 \times 10^{-3}</math></b>	90	<sup>1</sup> ACCIARRI	95H L3	$e^+e^- \rightarrow Z$

<sup>1</sup> ACCIARRI 95H assumes  $f_{B^0} = 39.5 \pm 4.0$  and  $f_{B_s} = 12.0 \pm 3.0\%$ .

### $\Gamma(\eta\eta)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt;1.5 \times 10^{-3}</math></b>	90	<sup>1</sup> ACCIARRI	95H L3	$e^+e^- \rightarrow Z$

<sup>1</sup> ACCIARRI 95H assumes  $f_{B^0} = 39.5 \pm 4.0$  and  $f_{B_s} = 12.0 \pm 3.0\%$ .

### $\Gamma(\rho^0\rho^0)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt;3.20 \times 10^{-4}</math></b>	90	<sup>1</sup> ABE	00C SLD	$e^+e^- \rightarrow Z$

<sup>1</sup> ABE 00C assumes  $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$  and the  $B$  fractions  $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$  and  $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$ .

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$\Gamma(\phi\rho^0)/\Gamma_{\text{total}}$	$\Gamma_{40}/\Gamma$			
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$<6.17 \times 10^{-4}$	90	1 ABE	00C SLD	$e^+ e^- \rightarrow Z$

1 ABE 00C assumes  $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$  and the  $B$  fractions  $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$  and  $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$ .

$\Gamma(\phi\phi)/\Gamma_{\text{total}}$	$\Gamma_{41}/\Gamma$			
<u>VALUE (units <math>10^{-6}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>18 <math>^{+6}_{-4}</math> OUR AVERAGE</b>		$[(19^{+6}_{-5}) \times 10^{-6}$ OUR 2012 AVERAGE]		

**17.7  $\pm 2.4^{+5.7}_{-3.2}$**  1 AALTONEN 11AN CDF  $p\bar{p}$  at 1.96 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$14^{+6}_{-5} \pm 6$	2 ACOSTA	05J CDF	Repl. by AALTONEN 11AN
$<1183$	90	3 ABE	00C SLD $e^+ e^- \rightarrow Z$

1 AALTONEN 11AN reports  $[\Gamma(B_s^0 \rightarrow \phi\phi)/\Gamma_{\text{total}}] / [B(B_s^0 \rightarrow J/\psi(1S)\phi)] = (1.78 \pm 0.14 \pm 0.20) \times 10^{-2}$  which we multiply by our best value  $B(B_s^0 \rightarrow J/\psi(1S)\phi) = (10.0^{+3.2}_{-1.8}) \times 10^{-4}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

2 Uses  $B(B^0 \rightarrow J/\psi\phi) = (1.38 \pm 0.49) \times 10^{-3}$  and production cross-section ratio of  $\sigma(B_s)/\sigma(B^0) = 0.26 \pm 0.04$ .

3 ABE 00C assumes  $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$  and the  $B$  fractions  $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$  and  $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$ .

$\Gamma(\pi^+ K^-)/\Gamma_{\text{total}}$	$\Gamma_{42}/\Gamma$			
<u>VALUE (units <math>10^{-6}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>5.5 <math>\pm 0.6</math> OUR AVERAGE</b>		$[(5.3 \pm 1.0) \times 10^{-6}$ OUR 2012 AVERAGE]		

$5.6 \pm 0.6 \pm 0.4$  1 AAIJ 12AR LHCb  $pp$  at 7 TeV  
 $5.4 \pm 0.9 \pm 0.4$  2 AALTONEN 09C CDF  $p\bar{p}$  at 1.96 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 26$	90	3 PENG	10 BELL	$e^+ e^- \rightarrow \gamma(5S)$
$< 5.6$	90	4 ABULENCIA,A 06D	CDF	Repl. by AALTONEN 09C
$< 261$	90	5 ABE	00C SLD	$e^+ e^- \rightarrow Z$
$< 210$	90	6 BUSKULIC	96V ALEP	$e^+ e^- \rightarrow Z$
$< 260$	90	7 AKERS	94L OPAL	$e^+ e^- \rightarrow Z$

1 AAIJ 12AR reports  $[\Gamma(B_s^0 \rightarrow \pi^+ K^-)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow K^+ \pi^-)] \times [\Gamma(\bar{b} \rightarrow B_s^0) / \Gamma(\bar{b} \rightarrow B^0)] = 0.074 \pm 0.006 \pm 0.006$  which we multiply or divide by our best values  $B(B^0 \rightarrow K^+ \pi^-) = (1.96 \pm 0.05) \times 10^{-5}$ ,  $\Gamma(\bar{b} \rightarrow B_s^0) / \Gamma(\bar{b} \rightarrow B^0) = 0.259 \pm 0.016$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

2 AALTONEN 09C reports  $[\Gamma(B_s^0 \rightarrow \pi^+ K^-)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow K^+ \pi^-)] \times [B(\bar{b} \rightarrow B_s^0) / B(\bar{b} \rightarrow B^0)] / [B(\bar{b} \rightarrow B^0)] = 0.071 \pm 0.010 \pm 0.007$  which we multiply or divide by our best values  $B(B^0 \rightarrow K^+ \pi^-) = (1.96 \pm 0.05) \times 10^{-5}$ ,  $B(\bar{b} \rightarrow B_s^0) = (10.4 \pm 0.6) \times 10^{-2}$ ,  $B(\bar{b} \rightarrow B^0) = (40.2 \pm 0.7) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

3 Uses  $\gamma(10860) \rightarrow B_s^* \bar{B}_s^*$  and assumes  $B(\gamma(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (19.3 \pm 2.9)\%$  and  $\Gamma(\gamma(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) / \Gamma(\gamma(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (90.1^{+3.8}_{-4.0})\%$ .

4 ABULENCIA,A 06D obtains this from  $(f_s/f_d)(B_s \rightarrow \pi^+ K^-) / B(B^0 \rightarrow K^+ \pi^-) < 0.08$  at 90% CL, assuming  $f_s/f_d = 0.260 \pm 0.039$  and  $B(B^0 \rightarrow K^+ \pi^-) = (18.9 \pm 0.7) \times 10^{-6}$ .

5 ABE 00C assumes  $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$  and the  $B$  fractions  $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$  and  $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$ .

6 BUSKULIC 96V assumes PDG 96 production fractions for  $B^0$ ,  $B^+$ ,  $B_s$ ,  $b$  baryons.

7 Assumes  $B(Z \rightarrow b\bar{b}) = 0.217$  and  $B_d^0 (B_s^0)$  fraction 39.5% (12%).

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$\Gamma(K^+K^-)/\Gamma_{\text{total}}$ 

VALUE (units $10^{-6}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>25.2± 1.7 OUR AVERAGE</b>				
$(26.4 \pm 2.8) \times 10^{-6}$		AVERAGE		
23.9± 1.6±1.6	1	AAIJ	12AR LHCb	$p\bar{p}$ at 7 TeV
26.3± 2.2±1.8	2	AALTONEN	11N CDF	$p\bar{p}$ at 1.96 TeV
38 ± 10 ± 7	3	PENG	10 BELL	$e^+e^- \rightarrow \gamma(5S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<310	90	DRUTSKOY	07A BELL	$e^+e^- \rightarrow \gamma(5S)$
33 ± 6 ± 7	4	ABULENCIA,A	06D CDF	Repl. by AALTONEN 11N
<283	90	5 ABE	00C SLD	$e^+e^- \rightarrow Z$
< 59	90	6 BUSKULIC	96V ALEP	$e^+e^- \rightarrow Z$
<140	90	7 AKERS	94L OPAL	$e^+e^- \rightarrow Z$

1 AAIJ 12AR reports  $[\Gamma(B_s^0 \rightarrow K^+K^-)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow K^+\pi^-)] \times [\Gamma(\bar{b} \rightarrow B_s^0)] / \Gamma(\bar{b} \rightarrow B^0) = 0.316 \pm 0.009 \pm 0.019$  which we multiply or divide by our best values  $B(B^0 \rightarrow K^+\pi^-) = (1.96 \pm 0.05) \times 10^{-5}$ ,  $\Gamma(\bar{b} \rightarrow B_s^0)/\Gamma(\bar{b} \rightarrow B^0) = 0.259 \pm 0.016$ . Our first error is their experiment's error and our second error is the systematic error from using our best values.

2 AALTONEN 11N reports  $(f_s/f_d)(B(B_s^0 \rightarrow K^+K^-) / B(B^0 \rightarrow K^+\pi^-)) = 0.347 \pm 0.020 \pm 0.021$ . We multiply this result by our best value of  $B(B^0 \rightarrow K^+\pi^-) = (1.96 \pm 0.05) \times 10^{-5}$  and divide by our best value of  $f_s/f_d$ , where  $1/2 f_s/f_d = 0.129 \pm 0.008$ . Our first quoted uncertainty is the combined experiment's uncertainty and our second is the systematic uncertainty from using out best values.

3 Uses  $\gamma(10860) \rightarrow B_s^* \bar{B}_s^*$  and assumes  $B(\gamma(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (19.3 \pm 2.9)\%$  and  $\Gamma(\gamma(10860) \rightarrow B_s^* \bar{B}_s^*) / \Gamma(\gamma(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (90.1^{+3.8}_{-4.0})\%$ .

4 ABULENCIA,A 06D obtains this from  $(f_s/f_d)(B(B_s \rightarrow K^+K^-) / B(B^0 \rightarrow K^+\pi^-)) = 0.46 \pm 0.08 \pm 0.07$ , assuming  $f_s/f_d = 0.260 \pm 0.039$  and  $B(B^0 \rightarrow K^+\pi^-) = (18.9 \pm 0.7) \times 10^{-6}$ .

5 ABE 00C assumes  $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$  and the  $B$  fractions  $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$  and  $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$ .

6 BUSKULIC 96V assumes PDG 96 production fractions for  $B^0$ ,  $B^+$ ,  $B_s$ ,  $b$  baryons.

7 Assumes  $B(Z \rightarrow b\bar{b}) = 0.217$  and  $B_d^0 (B_s^0)$  fraction 39.5% (12%).

 $\Gamma(K^0\bar{K}^0)/\Gamma_{\text{total}}$ 

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;6.6</b>	90	1 PENG	10 BELL	$e^+e^- \rightarrow \gamma(5S)$
<b>1</b> Uses $\gamma(10860) \rightarrow B_s^* \bar{B}_s^*$ and assumes $B(\gamma(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (19.3 \pm 2.9)\%$ and $\Gamma(\gamma(10860) \rightarrow B_s^* \bar{B}_s^*) / \Gamma(\gamma(10860) \rightarrow B_s^{(*)} \bar{B}_s^{(*)}) = (90.1^{+3.8}_{-4.0})\%$ .				

 $\Gamma(\bar{K}^*(892)^0\rho^0)/\Gamma_{\text{total}}$ 

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;7.67 × 10<sup>-4</sup></b>	90	1 ABE	00C SLD	$e^+e^- \rightarrow Z$
<b>1</b> ABE 00C assumes $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$ and the $B$ fractions $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$ and $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$ .				

 $\Gamma(\bar{K}^*(892)^0 K^*(892)^0)/\Gamma_{\text{total}}$ 

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>2.81±0.46±0.56</b>	1	AAIJ	12F LHCb	$p\bar{p}$ at 7 TeV
<b>• • •</b> We do not use the following data for averages, fits, limits, etc. • • •				
<168.1	90	2 ABE	00C SLD	$e^+e^- \rightarrow Z$
<b>1</b> Uses $B^0 \rightarrow J/\psi K^{*0}$ for normalization and assumes $B(B^0 \rightarrow J/\psi K^{*0}) B(J/\psi \rightarrow \mu^+\mu^-) B(K^{*0} \rightarrow K^+\pi^-) = (1.33 \pm 0.06) \times 10^{-3}$ and $f_s/f_d = 0.253 \pm 0.031$ . The second quoted error is total uncertainty including the error of 0.34 on $f_s/f_d$ .				
<b>2</b> ABE 00C assumes $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$ and the $B$ fractions $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$ and $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$ .				

 $\Gamma(\phi K^*(892)^0)/\Gamma_{\text{total}}$ 

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;10.13 × 10<sup>-4</sup></b>	90	1 ABE	00C SLD	$e^+e^- \rightarrow Z$
<b>1</b> ABE 00C assumes $B(Z \rightarrow b\bar{b}) = (21.7 \pm 0.1)\%$ and the $B$ fractions $f_{B^0} = f_{B^+} = (39.7^{+1.8}_{-2.2})\%$ and $f_{B_s} = (10.5^{+1.8}_{-2.2})\%$ .				

 $\Gamma_{43}/\Gamma$ 

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NODE=S086R8;LINKAGE=AB

NODE=S086R8;LINKAGE=KQ

NODE=S086R8;LINKAGE=BV

NODE=S086R8;LINKAGE=A

NODE=S086R39

NODE=S086R39

NODE=S086R39;LINKAGE=PE

NODE=S086R25

NODE=S086R25

NODE=S086R25;LINKAGE=KQ

NODE=S086R26

NODE=S086R26

NODE=S086R26;LINKAGE=AA

NODE=S086R26;LINKAGE=KQ

NODE=S086R28

NODE=S086R28

NODE=S086R28;LINKAGE=KQ

$\Gamma(p\bar{p})/\Gamma_{\text{total}}$ Test for  $\Delta B=1$  weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 5.9 \times 10^{-5}$	90	1 BUSKULIC	96V ALEP	$e^+ e^- \rightarrow Z$

<sup>1</sup> BUSKULIC 96V assumes PDG 96 production fractions for  $B^0$ ,  $B^+$ ,  $B_s$ ,  $b$  baryons. $\Gamma_{48}/\Gamma$ 

NODE=S086R16

NODE=S086R16

NODE=S086R16

NODE=S086R16;LINKAGE=BV

 $\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ Test for  $\Delta B=1$  weak neutral current.

VALUE (units $10^{-6}$ )	CL%	DOCUMENT ID	TECN	COMMENT
< 8.7	90	1 WICHT	08A BELL	$e^+ e^- \rightarrow \gamma(5S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 53	90	DRUTSKOY	07A BELL	Repl. by WICHT 08A
< 148	90	2 ACCIARRI	95I L3	$e^+ e^- \rightarrow Z$

<sup>1</sup> Assumes  $\gamma(5S) \rightarrow B_s^* \bar{B}_s^* = (19.5^{+3.0}_{-2.3})\%$ .<sup>2</sup> ACCIARRI 95I assumes  $f_{B^0} = 39.5 \pm 4.0$  and  $f_{B_s} = 12.0 \pm 3.0\%$ . $\Gamma_{49}/\Gamma$ 

NODE=S086R10

NODE=S086R10

NODE=S086R10

NODE=S086R10;LINKAGE=WI

NODE=S086R10;LINKAGE=A

 $\Gamma(\phi\gamma)/\Gamma_{\text{total}}$  $\Gamma_{50}/\Gamma$ 

VALUE (units $10^{-6}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>36 ± 4 OUR AVERAGE</b>				

[(57<sup>+22</sup><sub>-19</sub>) × 10<sup>-6</sup> OUR 2012 AVERAGE]

35.1 ± 3.5 ± 1.2		<sup>1</sup> AAIJ	13 LHCb	$p\bar{p}$ at 7 TeV
57 ± 18 ± 12		<sup>2</sup> WICHT	08A BELL	$e^+ e^- \rightarrow \gamma(5S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

39 ± 5		<sup>3</sup> AAIJ	12AE LHCb	Replaced by AAIJ 13
< 390	90	DRUTSKOY	07A BELL	$e^+ e^- \rightarrow \gamma(5S)$
< 120	90	ACOSTA	02G CDF	$p\bar{p}$ at 1.8 TeV
< 700	90	<sup>4</sup> ADAM	96D DLPH	$e^+ e^- \rightarrow Z$

<sup>1</sup> AAIJ 13 reports  $[\Gamma(B_s^0 \rightarrow \phi\gamma)/\Gamma_{\text{total}}] / [B(B^0 \rightarrow K^*(892)^0 \gamma)] = 0.81 \pm 0.04 \pm 0.07$  which we multiply by our best value  $B(B^0 \rightarrow K^*(892)^0 \gamma) = (4.33 \pm 0.15) \times 10^{-5}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.<sup>2</sup> Assumes  $\gamma(5S) \rightarrow B_s^* \bar{B}_s^* = (19.5^{+3.0}_{-2.3})\%$ .<sup>3</sup> Measures  $B(B^0 \rightarrow K^* \gamma)/B(B_s \rightarrow \phi\gamma) = 1.12 \pm 0.08(\text{stat})^{+0.06}_{-0.04}(\text{sys})^{+0.09}_{-0.08}(f_s/f_d)$  and uses current world-average value of  $B(B^0 \rightarrow K^* \gamma) = (4.33 \pm 0.15) \times 10^{-5}$ .<sup>4</sup> ADAM 96D assumes  $f_{B^0} = f_{B^-} = 0.39$  and  $f_{B_s} = 0.12$ .

NODE=S086R17;LINKAGE=AJ

NODE=S086R17;LINKAGE=WI

NODE=S086R17;LINKAGE=AI

NODE=S086R17;LINKAGE=DQ

 $\Gamma(\mu^+ \mu^-)/\Gamma_{\text{total}}$  $\Gamma_{51}/\Gamma$ Test for  $\Delta B = 1$  weak neutral current.

VALUE (units $10^{-9}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>3.2<sup>+1.4+0.5</sup><sub>-1.2-0.3</sub></b>		<sup>1</sup> AAIJ	13B LHCb	$p\bar{p}$ at 7, 8 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 19	90	<sup>2</sup> AAD	12AE ATLAS	$p\bar{p}$ at 7 TeV
< 12	90	<sup>3</sup> AAIJ	12A LHCb	Repl. by AAIJ 12W
< 3.8	90	<sup>4</sup> AAIJ	12W LHCb	Repl. by AAIJ 13B
< 6.4	90	<sup>5</sup> CHATRCHYAN	12A CMS	$p\bar{p}$ at 7 TeV
< 43	90	<sup>6</sup> AAIJ	11B LHCb	Repl. by AAIJ 12A
< 35	90	<sup>7</sup> AALTONEN	11AG CDF	$p\bar{p}$ at 1.96 TeV
< 16	90	<sup>8</sup> CHATRCHYAN	11T CMS	Repl. by CHATRCHYAN 12A
< 42	90	<sup>9</sup> ABAZOV	10S D0	$p\bar{p}$ at 1.96 TeV
< 47	90	<sup>9</sup> AALTONEN	08I CDF	Repl. by AALTONEN 11AG
< 94	90	<sup>10</sup> ABAZOV	07Q D0	Repl. by ABAZOV 10S
< 410	90	<sup>11</sup> ABAZOV	05E D0	$p\bar{p}$ at 1.96 TeV
< 150	90	<sup>12</sup> ABULENCIA	05 CDF	$p\bar{p}$ at 1.96 TeV
< 580	90	<sup>13</sup> ACOSTA	04D CDF	$p\bar{p}$ at 1.96 TeV
< 2000	90	<sup>14</sup> ABE	98 CDF	$p\bar{p}$ at 1.8 TeV
< 38000	90	<sup>15</sup> ACCIARRI	97B L3	$e^+ e^- \rightarrow Z$
< 8400	90	<sup>16</sup> ABE	96L CDF	Repl. by ABE 98

NODE=S086R14

NODE=S086R14

NODE=S086R14

- 1 Uses  $B$  production ratio  $f(\bar{b} \rightarrow B_s^0)/f(\bar{b} \rightarrow B_d^0) = 0.256 \pm 0.020$  and two normalization modes:  $B(B^+ \rightarrow J/\psi K^+ \rightarrow \mu^+ \mu^- K^+) = (6.01 \pm 0.21) \times 10^{-5}$  and  $B(B^0 \rightarrow K^+ \pi^-) = (1.94 \pm 0.06) \times 10^{-5}$ .
- 2 Uses  $B$  production ratio  $f(\bar{b} \rightarrow B^+)/f(\bar{b} \rightarrow B_s^0) = 3.75 \pm 0.29$  and  $B(B^+ \rightarrow J/\psi K^+ \rightarrow \mu^+ \mu^- K^+) = (6.0 \pm 0.2) \times 10^{-5}$ .
- 3 Uses  $B$  production ratio  $f(\bar{b} \rightarrow B_s^0)/f(\bar{b} \rightarrow B_d^0) = 0.267^{+0.021}_{-0.020}$  and three normalization modes  $B(B^+ \rightarrow J/\psi K^+ \rightarrow \mu^+ \mu^- K^+) = (6.01 \pm 0.21) \times 10^{-5}$ ,  $B(B^0 \rightarrow K^+ \pi^-) = (1.94 \pm 0.06) \times 10^{-5}$ , and  $B(B_s^0 \rightarrow J/\psi \phi \rightarrow \mu^+ \mu^- K^+ K^-) = (3.4 \pm 0.9) \times 10^{-5}$ .
- 4 Uses  $B$  production ratio  $f(\bar{b} \rightarrow B_s^0)/f(\bar{b} \rightarrow B_d^0) = 0.267^{+0.021}_{-0.020}$  and three normalization modes of  $B^+ \rightarrow J/\psi K^+$ ,  $B^0 \rightarrow K^+ \pi^-$ , and  $B_s^0 \rightarrow J/\psi \phi$ .
- 5 Uses  $f_s/f_u = 0.267 \pm 0.021$  and  $B(B^+ \rightarrow J/\psi K^+ \rightarrow \mu^+ \mu^- K^+) = (6.0 \pm 0.2) \times 10^{-5}$ .
- 6 Uses  $B$  production ratio  $f(\bar{b} \rightarrow B^+)/f(\bar{b} \rightarrow B_s^0) = 3.71 \pm 0.47$  and three normalization modes.
- 7 Uses  $B$  production ratio  $f(\bar{b} \rightarrow B^+)/f(\bar{b} \rightarrow B_s^0) = 3.55 \pm 0.47$  and  $B(B^+ \rightarrow J/\psi K^+ \rightarrow \mu^+ \mu^- K^+) = (6.01 \pm 0.21) \times 10^{-5}$ .
- 8 Uses  $B$  production ratio  $f(\bar{b} \rightarrow B^+)/f(\bar{b} \rightarrow B_s^0) = 3.55 \pm 0.42$  and  $B(B^+ \rightarrow J/\psi K^+ \rightarrow \mu^+ \mu^- K^+) = (6.0 \pm 0.2) \times 10^{-5}$ .
- 9 Uses  $B$  production ratio  $f(\bar{b} \rightarrow B^+)/f(\bar{b} \rightarrow B_s^0) = 3.86 \pm 0.59$ , and the number of  $B^+ \rightarrow J/\psi K^+$  decays.
- 10 Uses  $B$  production ratio  $f(\bar{b} \rightarrow B^+)/f(\bar{b} \rightarrow B_s^0) = 3.86 \pm 0.54$  and the number of  $B^+ \rightarrow J/\psi K^+$  decays.
- 11 Assumes production cross-section  $\sigma(B_s)/\sigma(B^+) = 0.270 \pm 0.034$ .
- 12 Assumes production cross section  $\sigma(B^+)/\sigma(B_s) = 3.71 \pm 0.41$  and  $B(B^+ \rightarrow J/\psi K^+ \rightarrow \mu^+ \mu^- K^+) = (5.88 \pm 0.26) \times 10^{-5}$ .
- 13 Assumes production cross-section  $\sigma(B_s)/\sigma(B^+) = 0.100/0.391$  and the CDF measured value of  $\sigma(B^+) = 3.6 \pm 0.6 \mu b$ .
- 14 ABE 98 assumes production of  $\sigma(B^0) = \sigma(B^+)$  and  $\sigma(B_s)/\sigma(B^0) = 1/3$ . They normalize to their measured  $\sigma(B^0, p_T(B) > 6, |y| < 1.0) = 2.39 \pm 0.32 \pm 0.44 \mu b$ .
- 15 ACCIARRI 97B assume PDG 96 production fractions for  $B^+$ ,  $B^0$ ,  $B_s$ , and  $\Lambda_b$ .
- 16 ABE 96L assumes  $B^+/B_s$  production ratio 3/1. They normalize to their measured  $\sigma(B^+, p_T(B) > 6 \text{ GeV}/c, |y| < 1) = 2.39 \pm 0.54 \mu b$ .

 $\Gamma(e^+ e^-)/\Gamma_{\text{total}}$ 

Test for $\Delta B = 1$ weak neutral current.				
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.8 \times 10^{-7}$	90	AALTONEN	09P	CDF $p\bar{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<5.4 \times 10^{-5}$	90	<sup>1</sup> ACCIARRI	97B L3	$e^+ e^- \rightarrow Z$
1 ACCIARRI 97B assume PDG 96 production fractions for $B^+$ , $B^0$ , $B_s$ , and $\Lambda_b$ .				

 $\Gamma(e^\pm \mu^\mp)/\Gamma_{\text{total}}$ 

Test of lepton family number conservation.				
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.0 \times 10^{-7}$	90	AALTONEN	09P	CDF $p\bar{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<6.1 \times 10^{-6}$	90	ABE	98V	CDF Repl. by AALTONEN 09P
$<4.1 \times 10^{-5}$	90	<sup>1</sup> ACCIARRI	97B L3	$e^+ e^- \rightarrow Z$
1 ACCIARRI 97B assume PDG 96 production fractions for $B^+$ , $B^0$ , $B_s$ , and $\Lambda_b$ .				

 $\Gamma(\phi(1020)\mu^+\mu^-)/\Gamma_{\text{total}}$ 

Test for $\Delta B = 1$ weak neutral current.				
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<3.2 \times 10^{-6}$	90	<sup>1</sup> ABAZOV	06G D0	$p\bar{p}$ at 1.96 TeV
$<4.7 \times 10^{-5}$	90	ACOSTA	02D CDF	$p\bar{p}$ at 1.8 TeV
1 Uses $B(B_s^0 \rightarrow J/\psi \phi) = 9.3 \times 10^{-4}$ .				

 $\Gamma(\phi(1020)\mu^+\mu^-)/\Gamma(J/\psi(1S)\phi)$ 

VALUE (units $10^{-3}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>1.13 <math>\pm</math> 0.19 <math>\pm</math> 0.07</b>		AALTONEN	11AI	CDF $p\bar{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.11 $\pm$ 0.25 $\pm$ 0.09		AALTONEN	11L	CDF Repl. by AALTONEN 11AI
<2.3	90	AALTONEN	09B	CDF Repl. by AALTONEN 11L

NODE=S086R14;LINKAGE=A

NODE=S086R14;LINKAGE=AD

NODE=S086R14;LINKAGE=AJ

NODE=S086R14;LINKAGE=IJ

NODE=S086R14;LINKAGE=CA

NODE=S086R14;LINKAGE=AI

NODE=S086R14;LINKAGE=AT

NODE=S086R14;LINKAGE=CH

NODE=S086R14;LINKAGE=AA

NODE=S086R14;LINKAGE=ZO

NODE=S086R14;LINKAGE=AB

NODE=S086R14;LINKAGE=AL

NODE=S086R14;LINKAGE=AC

NODE=S086R14;LINKAGE=C

NODE=S086R14;LINKAGE=BQ

NODE=S086R14;LINKAGE=PA

NODE=S086R18

NODE=S086R18

NODE=S086R18

NODE=S086R18;LINKAGE=BQ

NODE=S086R22

NODE=S086R22

NODE=S086R22

NODE=S086R22;LINKAGE=BQ

NODE=S086R31

NODE=S086R31

NODE=S086R31

NODE=S086R31;LINKAGE=AB

NODE=S086R51

NODE=S086R51

$\Gamma(\phi\nu\bar{\nu})/\Gamma_{\text{total}}$ 

Test for $\Delta B = 1$ weak neutral current.				
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<5.4 \times 10^{-3}$	90	1 ADAM	96D DLPH	$e^+ e^- \rightarrow Z$
<sup>1</sup> ADAM 96D assumes $f_{B^0} = f_{B^-} = 0.39$ and $f_{B_s} = 0.12$ .				

 $\Gamma_{55}/\Gamma$ 

NODE=S086R21  
NODE=S086R21  
NODE=S086R21

NODE=S086R21;LINKAGE=DQ

NODE=S086233

NODE=S086P01  
NODE=S086P01

NODE=S086P1  
NODE=S086P1  
NEW

 $\Gamma_L/\Gamma$  in  $B_s^0 \rightarrow D_s^* \rho^+$ 

VALUE	DOCUMENT ID	TECN	COMMENT
$1.05^{+0.08+0.03}_{-0.10-0.04}$	LOUVOT	10 BELL	$e^+ e^- \rightarrow \gamma(5S)$

 $\Gamma_L/\Gamma$  in  $B_s^0 \rightarrow J/\psi(1S)\phi$ 

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
$0.542 \pm 0.011$ OUR AVERAGE				

[ $0.543 \pm 0.016$  OUR 2012 AVERAGE Scale factor = 1.2]

$0.539 \pm 0.014 \pm 0.016$	<sup>1</sup> AAD	12CV ATLS	$p\bar{p}$ at 7 TeV
$0.524 \pm 0.013 \pm 0.015$	<sup>1</sup> AALTONEN	12D CDF	$p\bar{p}$ at 1.96 TeV
$0.558^{+0.017}_{-0.019}$	<sup>1,2</sup> ABAZOV	12D D0	$p\bar{p}$ at 1.96 TeV
$0.61 \pm 0.14 \pm 0.02$	<sup>3</sup> AFFOLDER	00N CDF	$p\bar{p}$ at 1.8 TeV
$0.56 \pm 0.21^{+0.02}_{-0.04}$	19 ABE	95Z CDF	$p\bar{p}$ at 1.8 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.555 \pm 0.027 \pm 0.006$	<sup>4</sup> ABAZOV	09E D0	Repl. by ABAZOV 12D
$0.531 \pm 0.020 \pm 0.007$	<sup>1</sup> AALTONEN	08J CDF	Repl. by AALTONEN 12D
$0.62 \pm 0.06 \pm 0.01$	ACOSTA	05 CDF	Repl. by AALTONEN 08J

1 Measured using the time-dependent angular analysis of  $B_s^0 \rightarrow J/\psi\phi$  decays.

2 The error includes both statistical and systematic uncertainties.

3 AFFOLDER 00N measurements are based on 40  $B_s^0$  candidates obtained from a data sample of  $89 \text{ pb}^{-1}$ . The  $P$ -wave fraction is found to be  $0.23 \pm 0.19 \pm 0.04$ .4 Measured the angular and lifetime parameters for the time-dependent angular untagged decays  $B_d^0 \rightarrow J/\psi K^{*0}$  and  $B_s^0 \rightarrow J/\psi\phi$ .

NODE=S086P1;LINKAGE=AC  
NODE=S086P1;LINKAGE=CE  
NODE=S086P1;LINKAGE=P1

NODE=S086P1;LINKAGE=AB

NODE=S086P08  
NODE=S086P08

 $\Gamma_L/\Gamma$  in  $B_s^0 \rightarrow D_s^{*+} D_s^{*-}$ 

VALUE	DOCUMENT ID	TECN	COMMENT
$0.06^{+0.18}_{-0.17} \pm 0.03$	ESEN	13 BELL	$e^+ e^- \rightarrow \gamma(5S)$

 $\Gamma_{||}/\Gamma$  in  $B_s^0 \rightarrow J/\psi(1S)\phi$ 

VALUE	DOCUMENT ID	TECN	COMMENT
$0.227 \pm 0.010$ OUR AVERAGE			

[ $0.231 \pm 0.016$  OUR 2012 AVERAGE]

$0.224 \pm 0.010 \pm 0.009$	<sup>1</sup> AAD	12CV ATLS	$p\bar{p}$ at 7 TeV
$0.231 \pm 0.014 \pm 0.015$	<sup>1</sup> AALTONEN	12D CDF	$p\bar{p}$ at 1.96 TeV
$0.231^{+0.024}_{-0.030}$	<sup>1,2</sup> ABAZOV	12D D0	$p\bar{p}$ at 1.96 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.244 \pm 0.032 \pm 0.014$	<sup>3</sup> ABAZOV	09E D0	Repl. by ABAZOV 12D
$0.230 \pm 0.029 \pm 0.011$	<sup>1</sup> AALTONEN	08J CDF	Repl. by AALTONEN 12D
$0.260 \pm 0.084 \pm 0.013$	ACOSTA	05 CDF	Repl. by AALTONEN 08J

1 Measured using the time-dependent angular analysis of  $B_s^0 \rightarrow J/\psi\phi$  decays.

2 The error includes both statistical and systematic uncertainties.

3 Measured the angular and lifetime parameters for the time-dependent angular untagged decays  $B_d^0 \rightarrow J/\psi K^{*0}$  and  $B_s^0 \rightarrow J/\psi\phi$ .

NODE=S086P2  
NODE=S086P2  
NEW

NODE=S086P2;LINKAGE=AC  
NODE=S086P2;LINKAGE=CE  
NODE=S086P2;LINKAGE=AB

NODE=S086P03  
NODE=S086P03

 $\phi_{||}$  in  $B_s^0 \rightarrow J/\psi(1S)\phi$ 

VALUE (rad)	DOCUMENT ID	TECN	COMMENT
$3.15 \pm 0.22$	<sup>1</sup> ABAZOV	12D D0	$p\bar{p}$ at 1.96 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$2.72^{+1.12}_{-0.27} \pm 0.26$	ABAZOV	09E D0	Repl. by ABAZOV 12D
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1 The error includes both statistical and systematic uncertainties.

NODE=S086P03;LINKAGE=CE

**$\Gamma_L/\Gamma$  for  $B_s^0 \rightarrow J/\psi(1S)K^*(892)^0$** 

Longitudinal polarization fraction, equals to  $f_L$  using notation of "Polarization in  $B$  decays" review.

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.50±0.08±0.02</b>	<sup>1</sup> AAIJ	12AP LHCb	$p\bar{p}$ at 7 TeV

<sup>1</sup> The non-resonant  $K\pi$  background contributions are subtracted. Also reports an  $S$ -wave amplitude  $|A_S|^2 = 0.07^{+0.15}_{-0.07}$ .

NODE=S086PK1

NODE=S086PK1

NODE=S086PK1

NODE=S086PK1;LINKAGE=AA

 **$\Gamma_{||}/\Gamma$  for  $B_s^0 \rightarrow J/\psi(1S)K^*(892)^0$** 

Parallel polarization fraction, equals to  $1 - f_L - f_{\perp}$  using notation of "Polarization in  $B$  decays" review.

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.19^{+0.10}_{-0.08} \pm 0.02</b>	<sup>1</sup> AAIJ	12AP LHCb	$p\bar{p}$ at 7 TeV

<sup>1</sup> The non-resonant  $K\pi$  background contributions are subtracted. Also reports an  $S$ -wave amplitude  $|A_S|^2 = 0.07^{+0.15}_{-0.07}$ .

NODE=S086PK2

NODE=S086PK2

NODE=S086PK2

NODE=S086PK2;LINKAGE=AA

 **$\Gamma_L/\Gamma$  in  $B_s^0 \rightarrow \phi\phi$** 

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.361±0.022 OUR AVERAGE</b> [0.35 ± 0.05 OUR 2012 AVERAGE]			

0.365±0.022±0.012	AAIJ	12P LHCb	$p\bar{p}$ at 7 TeV
0.348±0.041±0.021	AALTONEN	11AN CDF	$p\bar{p}$ at 1.96 TeV

NODE=S086P05

NODE=S086P05

NEW

 **$\Gamma_{\perp}/\Gamma$  in  $B_s^0 \rightarrow \phi\phi$** 

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.306±0.030 OUR AVERAGE</b> [0.36 ± 0.05 OUR 2012 AVERAGE]		Error includes scale factor of 1.3.	[0.36 ± 0.05 OUR 2012 AVERAGE]

0.291±0.024±0.010	AAIJ	12P LHCb	$p\bar{p}$ at 7 TeV
0.365±0.044±0.027	AALTONEN	11AN CDF	$p\bar{p}$ at 1.96 TeV

NODE=S086P06

NODE=S086P06

NEW

 **$\phi_{||}$  in  $B_s^0 \rightarrow \phi\phi$** 

VALUE (rad)	DOCUMENT ID	TECN	COMMENT
<b>2.59±0.15 OUR AVERAGE</b> [2.7 ± 0.4 rad OUR 2012 AVERAGE]			

2.57±0.15±0.06	<sup>1</sup> AAIJ	12P LHCb	$p\bar{p}$ at 7 TeV
2.71^{+0.31}_{-0.36}±0.22	<sup>2</sup> AALTONEN	11AN CDF	$p\bar{p}$ at 1.96 TeV

NODE=S086P07

NODE=S086P07

NEW

<sup>1</sup> AAIJ 12P quotes  $\cos\phi_{||} = -0.844 \pm 0.068 \pm 0.029$  which we convert to  $\phi_{||}$ , taking the smaller solution.

<sup>2</sup> AALTONEN 11AN quotes  $\cos\phi_{||} = -0.91^{+0.15}_{-0.13} \pm 0.09$  which we convert to  $\phi_{||}$  taking the smaller solution.

NODE=S086P07;LINKAGE=AI

NODE=S086P07;LINKAGE=AA

 **$\Gamma_L/\Gamma$  in  $B_s^0 \rightarrow K^{*0}\bar{K}^{*0}$** 

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.31±0.12±0.04</b>	AAIJ	12F LHCb	$p\bar{p}$ at 7 TeV

NODE=S086P02

NODE=S086P02

 **$\Gamma_{\perp}/\Gamma$  in  $B_s^0 \rightarrow K^{*0}\bar{K}^{*0}$** 

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.38±0.11±0.04</b>	AAIJ	12F LHCb	$p\bar{p}$ at 7 TeV

NODE=S086P04

NODE=S086P04

 **$B_s^0-\bar{B}_s^0$  MIXING**

NODE=S086235

NODE=S086235

For a discussion of  $B_s^0-\bar{B}_s^0$  mixing see the note on "B<sup>0</sup>-B̄<sup>0</sup> Mixing" in the B<sup>0</sup> Particle Listings above.

$\chi_s$  is a measure of the time-integrated  $B_s^0-\bar{B}_s^0$  mixing probability that produced  $B_s^0(\bar{B}_s^0)$  decays as a  $\bar{B}_s^0(B_s^0)$ . Mixing violates  $\Delta B \neq 2$  rule.

$$\chi_s = \frac{x_s^2}{2(1+x_s^2)}$$

$$x_s = \frac{\Delta m_{B_s^0}}{\Gamma_{B_s^0}} = (m_{B_{sH}^0} - m_{B_{sL}^0}) \tau_{B_s^0},$$

where H, L stand for heavy and light states of two  $B_s^0$  CP eigenstates and

$$\tau_{B_s^0} = \frac{1}{0.5(\Gamma_{B_{sH}^0} + \Gamma_{B_{sL}^0})}.$$

$$\Delta m_{B_s^0} = m_{B_{sH}^0} - m_{B_{sL}^0}$$

$\Delta m_{B_s^0}$  is a measure of  $2\pi$  times the  $B_s^0$ - $\bar{B}_s^0$  oscillation frequency in time-dependent mixing experiments.

"OUR EVALUATION" is provided by the Heavy Flavor Averaging Group (HFAG) by taking into account correlations between measurements.

VALUE ( $10^{12} \text{ Hz s}^{-1}$ )	CL%	DOCUMENT ID	TECN	COMMENT
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### 17.69±0.08 OUR EVALUATION

### 17.69±0.08 OUR AVERAGE

17.63±0.11±0.02	1	AAIJ	12I	LHCb $p\bar{p}$ at 7 TeV
17.77±0.10±0.07	2	ABULENCIA,A	06G	CDF $p\bar{p}$ at 1.96 TeV
<b>• • • We do not use the following data for averages, fits, limits, etc. • • •</b>				
17-21	90	3 ABAZOV	06B	D0 $p\bar{p}$ at 1.96 TeV
17.31 <sup>+0.33</sup> <sub>-0.18</sub> ±0.07	4	ABULENCIA	06Q	CDF Repl. by ABULENCIA,A 06G
> 8.0	95	5 ABDALLAH	04J	DLPH $e^+e^- \rightarrow Z^0$
> 4.9	95	6 ABDALLAH	04J	DLPH $e^+e^- \rightarrow Z^0$
> 8.5	95	7 ABDALLAH	04J	DLPH $e^+e^- \rightarrow Z^0$
> 5.0	95	8 ABDALLAH	03B	DLPH $e^+e^- \rightarrow Z$
>10.3	95	9 ABE	03	SLD $e^+e^- \rightarrow Z$
>10.9	95	10 HEISTER	03E	ALEP $e^+e^- \rightarrow Z$
> 5.3	95	11 ABE	02V	SLD $e^+e^- \rightarrow Z$
> 1.0	95	12 ABBIENDI	01D	OPAL $e^+e^- \rightarrow Z$
> 7.4	95	13 ABREU	00Y	DLPH Repl. by ABDALLAH 04J
> 4.0	95	14 ABREU,P	00G	DLPH $e^+e^- \rightarrow Z$
> 5.2	95	15 ABBIENDI	99S	OPAL $e^+e^- \rightarrow Z$
<96	95	16 ABE	99D	CDF $p\bar{p}$ at 1.8 TeV
> 5.8	95	17 ABE	99J	CDF $p\bar{p}$ at 1.8 TeV
> 9.6	95	18 BARATE	99J	ALEP $e^+e^- \rightarrow Z$
> 7.9	95	19 BARATE	98C	ALEP Repl. by BARATE 99J
> 3.1	95	20 ACKERSTAFF	97U	OPAL Repl. by ABBIENDI 99S
> 2.2	95	21 ACKERSTAFF	97V	OPAL Repl. by ABBIENDI 99S
> 6.5	95	22 ADAM	97	DLPH Repl. by ABREU 00Y
> 6.6	95	23 BUSKULIC	96M	ALEP Repl. by BARATE 98C
> 2.2	95	21 AKERS	95J	OPAL Sup. by ACKERSTAFF 97V
> 5.7	95	24 BUSKULIC	95J	ALEP $e^+e^- \rightarrow Z$
> 1.8	95	21 BUSKULIC	94B	ALEP $e^+e^- \rightarrow Z$

1 Measured using  $B_s^0 \rightarrow D_s^- \pi^+$  and  $D_s^- \pi^+ \pi^- \pi^+$  decays.

2 Significance of oscillation signal is  $5.4 \sigma$ . Also reports  $|V_{td} / V_{ts}| = 0.2060 \pm 0.0007^{+0.0081}_{-0.0060}$ .

3 A likelihood scan over the oscillation frequency,  $\Delta m_s$ , gives a most probable value of  $19 \text{ ps}^{-1}$  and a range of  $17 < \Delta m_s < 21 \text{ (ps}^{-1})$  at 90% C.L. assuming Gaussian uncertainties. Also excludes  $\Delta m_s < 14.8 \text{ ps}^{-1}$  at 95% C.L.

4 Significance of oscillation signal is 0.2%. Also reported the value  $|V_{td} / V_{ts}| = 0.208^{+0.001+0.008}_{-0.002-0.006}$ .

5 Uses leptons emitted with large momentum transverse to a jet and improved techniques for vertexing and flavor-tagging.

6 Updates of  $D_s$ -lepton analysis.

7 Combined results from all Delphi analyses.

8 Events with a high transverse momentum lepton were removed and an inclusively reconstructed vertex was required.

9 ABE 03 uses the novel "charge dipole" technique to reconstruct separate secondary and tertiary vertices originating from the  $B \rightarrow D$  decay chain. The analysis excludes  $\Delta m_s < 4.9 \text{ ps}^{-1}$  and  $7.9 < \Delta m_s < 10.3 \text{ ps}^{-1}$ .

10 Three analyses based on complementary event selections: (1) fully-reconstructed hadronic decays; (2) semileptonic decays with  $D_s$  exclusively reconstructed; (3) inclusive semileptonic decays.

11 ABE 02V uses exclusively reconstructed  $D_s^-$  mesons and excludes  $\Delta m_s < 1.4 \text{ ps}^{-1}$  and  $2.4 < \Delta m_s < 5.3 \text{ ps}^{-1}$  at 95%CL.

12 Uses fully or partially reconstructed  $D_s \ell$  vertices and a mixing tag as a flavor tagging.

13 Replaced by ABDALLAH 04A. Uses  $D_s^- \ell^+$ , and  $\phi \ell^+$  vertices, and a multi-variable discriminant as a flavor tagging.

14 Uses inclusive  $D_s$  vertices and fully reconstructed  $B_s$  decays and a multi-variable discriminant as a flavor tagging.

15 Uses  $\ell$ - $Q_{\text{hem}}$  and  $\ell$ - $\ell$ .

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NODE=S086D

NODE=S086D

→ UNCHECKED ←

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OCCUR=3

OCCUR=2

OCCUR=2

OCCUR=2

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NODE=S086D;LINKAGE=LZ

NODE=S086D;LINKAGE=H

NODE=S086D;LINKAGE=A3

- 16 ABE 99D assumes  $\tau_{B_s^0} = 1.55 \pm 0.05$  ps and  $\Delta\Gamma/\Delta m = (5.6 \pm 2.6) \times 10^{-3}$ .
- 17 ABE 99J uses  $\phi$   $\ell\bar{\ell}$  correlation.
- 18 BARATE 99J uses combination of an inclusive lepton and  $D_s^-$ -based analyses.
- 19 BARATE 98C combines results from  $D_s h\ell/Q_{\text{hem}}$ ,  $D_s hK$  in the same side,  $D_s \ell/Q_{\text{hem}}$  and  $D_s \ell K$  in the same side.
- 20 Uses  $\ell Q_{\text{hem}}$ .
- 21 Uses  $\ell\bar{\ell}$ .
- 22 ADAM 97 combines results from  $D_s \ell Q_{\text{hem}}$ ,  $\ell Q_{\text{hem}}$ , and  $\ell\bar{\ell}$ .
- 23 BUSKULIC 96M uses  $D_s$  lepton correlations and lepton, kaon, and jet charge tags.
- 24 BUSKULIC 95J uses  $\ell Q_{\text{hem}}$ . They find  $\Delta m_s > 5.6$  [ $> 6.1$ ] for  $f_s = 10\%$  [12%]. We interpolate to our central value  $f_s = 10.5\%$ .

$$x_s = \Delta m_{B_s^0} / \Gamma_{B_s^0}$$

This is derived by the Heavy Flavor Averaging Group (HFAG) from the results on  $\Delta m_{B_s^0}$  and "OUR EVALUATION" of the  $B_s^0$  mean lifetime.

VALUE	DOCUMENT ID
<b>26.82±0.23 OUR EVALUATION</b> [ $26.49 \pm 0.29$ OUR 2012 EVALUATION]	

$$x_s$$

This is a  $B_s^0 - \bar{B}_s^0$  integrated mixing parameter derived from  $x_s$  above and OUR EVALUATION of  $\Delta\Gamma_{B_s^0}/\Gamma_{B_s^0}$ .

VALUE	DOCUMENT ID
<b>0.499309±0.000012 OUR EVALUATION</b> [ $0.499292 \pm 0.000016$ OUR 2012 EVALUATION]	

## CP VIOLATION PARAMETERS in $B_s^0$

$$\text{Re}(\epsilon_{B_s^0}) / (1 + |\epsilon_{B_s^0}|^2)$$

CP impurity in  $B_s^0$  system.

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at <http://www.slac.stanford.edu/xorg/hfag/>. The averaging/scaling procedure takes into account correlation between the measurements. The value has been obtained from a 2D fit of the  $B_d$  and  $B_s$  asymmetries, which includes the  $B_s$  measurements listed below and the  $B$  factory average for the  $B_d$ .

VALUE (units $10^{-3}$ )	DOCUMENT ID	TECN	COMMENT
<b>-4.3±1.4 OUR EVALUATION</b> [ $(-2.6 \pm 1.6) \times 10^{-3}$ OUR 2012 EVALUATION]			
<b>-2.4±1.3 OUR AVERAGE</b> [ $(-2.2 \pm 2.0) \times 10^{-3}$ OUR 2012 AVERAGE Scale factor = 1.1]			
-2.8±1.9±0.4	<sup>1</sup> ABAZOV	13 D0	$p\bar{p}$ at 1.96 TeV
-4.5±2.7	<sup>2</sup> ABAZOV	11U D0	$p\bar{p}$ at 1.96 TeV
-0.4±2.3±0.4	<sup>3</sup> ABAZOV	10E D0	$p\bar{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-3.6±1.9	<sup>4</sup> ABAZOV	10H D0	Repl. by ABAZOV 11U
6.1±4.8±0.9	<sup>5</sup> ABAZOV	07A D0	Repl. by ABAZOV 10E

<sup>1</sup> ABAZOV 13 reports a measurement of time-integrated flavor-specific asymmetry in mixed semileptonic  $B_s^0 \rightarrow \mu^+ D_s^- X$  decays  $A_{SL}^{SL} = (-1.12 \pm 0.74 \pm 0.17)\%$  which is approximately equal to  $4 \times \text{Re}(\epsilon_{B_s^0}) / (1 + |\epsilon_{B_s^0}|^2)$ .

<sup>2</sup> ABAZOV 11U uses the dimuon charge asymmetry with different impact parameters from which it reports  $A_{SL}^s = (-18.1 \pm 10.6) \times 10^{-3}$ .

<sup>3</sup> ABAZOV 10E reports a measurement of flavor-specific asymmetry in  $B_{(s)}^0 \rightarrow \mu^+ D_{(s)}^{*-} X$  decays with a decay-time analysis including initial-state flavor tagging,  $A_{SL}^s = (-1.7 \pm 9.1^{+1.4}_{-1.5}) \times 10^{-3}$  which is approximately equal to  $4 \times \text{Re}(\epsilon_{B_s^0}) / (1 + |\epsilon_{B_s^0}|^2)$ .

<sup>4</sup> ABAZOV 10H reports a measurement of like-sign dimuon charge asymmetry of  $A_{SL}^b = (-9.57 \pm 2.51 \pm 1.46) \times 10^{-3}$  in semileptonic  $b$ -hadron decays. Using the measured production ratio of  $B_d^0$  and  $B_s^0$ , and the asymmetry of  $B_d^0 A_{SL}^d = (-4.7 \pm 4.6) \times 10^{-3}$  measured from  $B$ -factories, they obtain the asymmetry for  $B_s^0$ .

<sup>5</sup> The first direct measurement of the time integrated flavor untagged charge asymmetry in semileptonic  $B_s^0$  decays is reported as  $2 \times A_{SL}^s (\text{untagged}) = A_{SL}^s = (2.45 \pm 1.93 \pm 0.35) \times 10^{-2}$ .

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NODE=S086EPS;LINKAGE=AA

NODE=S086EPS;LINKAGE=AZ

NODE=S086EPS;LINKAGE=AB

## **CP Violation phase $\beta_s$**

$-2\beta_s$  is the weak phase difference between  $B_s^0$  mixing amplitude and the  $B_s^0 \rightarrow J/\psi\phi$  decay amplitude. The Standard Model value of  $\beta_s$  is  $\arg(-\frac{V_{ts}V_{tb}^*}{V_{cs}V_{cb}^*})$ .

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at <http://www.slac.stanford.edu/xorg/hfag/>. The averaging/scaling procedure takes into account correlation between the measurements.

VALUE (units $10^{-2}$ )	DOCUMENT ID	TECN	COMMENT
<b>4    +10 -13    OUR EVALUATION</b>			NODE=S086PHS
[ $0.08^{+0.05}_{-0.07}$ OUR 2012 EVALUATION]			NEW;→ UNCHECKED ←
<b>= 1    ± 6    OUR AVERAGE</b>			NEW
[ $0.02 \pm 0.11$ OUR 2012 AVERAGE Scale factor = 1.3]			
-11.0 $\pm$ 20.5 $\pm$ 5.0	<sup>1</sup> AAD	12CV ATLS	$p\bar{p}$ at 7 TeV
- 8 $\pm$ 9 $\pm$ 3	<sup>2</sup> AAIJ	12D LHCb	$p\bar{p}$ at 7 TeV
$0.95^{+0.15}_{-0.20}$ $8.70^{+0.15}_{-0.20}$	<sup>3</sup> AAIJ	12Q LHCb	$p\bar{p}$ at 7 TeV
	<sup>4</sup> AALTONEN	12AJ CDF	$p\bar{p}$ at 1.96 TeV
28 $\pm$ 18	5,6, <sup>7</sup> ABAZOV	12D D0	$p\bar{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
22 $\pm$ 22 $\pm$ 1	<sup>8</sup> AAIJ	12B LHCb	Repl. by AAIJ 12Q
	<sup>9</sup> AALTONEN	12D CDF	Repl. by AALTONEN 12AJ
	<sup>10</sup> AALTONEN	08G CDF	Repl. by AALTONEN 12D
28 $\pm$ 12 $\pm$ 4	6,11 ABAZOV	08AM D0	Repl. by ABAZOV 12D
39.5 $\pm$ 28.0 $\pm$ 0.5	7,12 ABAZOV	07 D0	Repl. by ABAZOV 07N
35 $\pm$ 20 $\pm$ 4	7,13 ABAZOV	07N D0	Repl. by ABAZOV 08AM
1 AAD 12CV reports $\phi_s = -2\beta_s = 0.22 \pm 0.41 \pm 0.10$ rad. that was measured using a time-dependent angular analysis of $B_s^0 \rightarrow J/\psi\phi$ decays.			NODE=S086PHS;LINKAGE=AD
2 Reports $\phi_s = -2\beta_s = 0.15 \pm 0.18 \pm 0.06$ that was measured using a time-dependent angular analysis of $B_s^0 \rightarrow J/\psi\phi$ decays.			NODE=S086PHS;LINKAGE=AJ
3 Reports $\phi_s = -2\beta_s = -0.019^{+0.173+0.004}_{-0.174-0.003}$ radians which was measured using a time-dependent fit to $B_s^0 \rightarrow J/\psi\pi^+\pi^-$ decays, with the $\pi^+\pi^-$ mass within 775–1550 MeV. Searches for, but finds no evidence, for direct CP violation in $B_s^0 \rightarrow J/\psi\pi\pi$ decays.			NODE=S086PHS;LINKAGE=IA
4 AALTONEN 12AJ reports $-\pi/2 < \beta_s < -1.51$ or $-0.06 < \beta_s < 0.30$ , or $1.26 < \beta_s < \pi/2$ at 68% CL. Measured using the time-dependent angular analysis of $B_s^0 \rightarrow J/\psi\phi$ decays.			NODE=S086PHS;LINKAGE=AL
5 The error includes both statistical and systematic uncertainties.			NODE=S086PHS;LINKAGE=CE
6 Measured using fully reconstructed $B_s \rightarrow J/\psi\phi$ decays.			NODE=S086PHS;LINKAGE=OV
7 Reports $\phi_s$ which equals to $-2\beta_s$ .			NODE=S086PHS;LINKAGE=RP
8 Reports $\phi_s = -2\beta_s = -0.44 \pm 0.44 \pm 0.02$ that was measured using a time-dependent fit to $B_s^0 \rightarrow J/\psi f_0(980)$ decays.			NODE=S086PHS;LINKAGE=AI
9 Reports $0.02 < \phi_s < 0.52$ or $1.08 < \phi_s < 1.55$ at 68% C.L. confidence regions in the two-dimensional space of $\phi_s$ and $\Delta\Gamma$ from $B_s^0 \rightarrow J/\psi\phi$ decays.			NODE=S086PHS;LINKAGE=AT
10 Reports $0.32 < 2\beta_s < 2.82$ at 68% C.L. and confidence regions in the two-dimensional space of $2\beta_s$ and $\Delta\Gamma$ from the first measurement of $B_s^0 \rightarrow J/\psi\phi$ decays using flavor tagging. The probability of a deviation from SM prediction as large as the level of observed data is 15%.			NODE=S086PHS;LINKAGE=AA
11 Reports $\phi_s = -2\beta_s$ and obtains 90% CL interval $-0.03 < \beta_s < 0.60$ .			NODE=S086PHS;LINKAGE=ZV
12 The first direct measurement of the CP-violating mixing phase is reported from the time-dependent analysis of flavor untagged $B_s^0 \rightarrow J/\psi\phi$ decays.			NODE=S086PHS;LINKAGE=AZ
13 Combines D0 collaboration measurements of time-dependent angular distributions in $B_s^0 \rightarrow J/\psi\phi$ and charge asymmetry in semileptonic decays. There is a 4-fold ambiguity in the solution.			NODE=S086PHS;LINKAGE=ZO

**$A_{CP}(B_s \rightarrow \pi^+ K^-)$**  $A_{CP}$  is defined as

$$\frac{B(\bar{B}_s^0 \rightarrow f) - B(\bar{B}_s^0 \rightarrow \bar{f})}{B(\bar{B}_s^0 \rightarrow f) + B(\bar{B}_s^0 \rightarrow \bar{f})},$$

the  $CP$ -violation asymmetry of exclusive  $\bar{B}_s^0$  and  $\bar{B}_s^0$  decay.

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.29±0.07 OUR AVERAGE</b> [0.39 ± 0.17 OUR 2012 AVERAGE]			
0.27±0.08±0.02	AAIJ	12V	LHCb $p\bar{p}$ at 7 TeV
0.39±0.15±0.08	AALTONEN	11N	CDF $p\bar{p}$ at 1.96 TeV

NODE=S086CP1

NODE=S086CP1

 **$A_{CP}(B_s^0 \rightarrow [K^+ K^-]_D \bar{K}^*(892)^0)$** 

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.04±0.16±0.01</b>	AAIJ	13L	LHCb $p\bar{p}$ at 7 TeV

NODE=S086CP2

NODE=S086CP2

**PARTIAL BRANCHING FRACTIONS IN  $B_s \rightarrow \phi \ell^+ \ell^-$**  **$B(B_s \rightarrow \phi \ell^+ \ell^-) (q^2 < 2.0 \text{ GeV}^2/c^2)$** 

VALUE (units $10^{-7}$ )	DOCUMENT ID	TECN	COMMENT
<b>2.78±0.95±0.89</b>	AALTONEN	11AI	CDF $p\bar{p}$ at 1.96 TeV

NODE=S086245

NODE=S086PB1

NODE=S086PB1

 **$B(B_s \rightarrow \phi \ell^+ \ell^-) (2.0 < q^2 < 4.3 \text{ GeV}^2/c^2)$** 

VALUE (units $10^{-7}$ )	DOCUMENT ID	TECN	COMMENT
<b>0.58±0.55±0.19</b>	AALTONEN	11AI	CDF $p\bar{p}$ at 1.96 TeV

NODE=S086PB2

NODE=S086PB2

 **$B(B_s \rightarrow \phi \ell^+ \ell^-) (4.3 < q^2 < 8.68 \text{ GeV}^2/c^2)$** 

VALUE (units $10^{-7}$ )	DOCUMENT ID	TECN	COMMENT
<b>1.34±0.83±0.43</b>	AALTONEN	11AI	CDF $p\bar{p}$ at 1.96 TeV

NODE=S086PB3

NODE=S086PB3

 **$B(B_s \rightarrow \phi \ell^+ \ell^-) (10.09 < q^2 < 12.86 \text{ GeV}^2/c^2)$** 

VALUE (units $10^{-7}$ )	DOCUMENT ID	TECN	COMMENT
<b>2.98±0.95±0.95</b>	AALTONEN	11AI	CDF $p\bar{p}$ at 1.96 TeV

NODE=S086PB4

NODE=S086PB4

 **$B(B_s \rightarrow \phi \ell^+ \ell^-) (14.18 < q^2 < 16.0 \text{ GeV}^2/c^2)$** 

VALUE (units $10^{-7}$ )	DOCUMENT ID	TECN	COMMENT
<b>1.86±0.66±0.59</b>	AALTONEN	11AI	CDF $p\bar{p}$ at 1.96 TeV

NODE=S086PB5

NODE=S086PB5

 **$B(B_s \rightarrow \phi \ell^+ \ell^-) (16.0 < q^2 < 19.0 \text{ GeV}^2/c^2)$** 

VALUE (units $10^{-7}$ )	DOCUMENT ID	TECN	COMMENT
<b>2.32±0.76±0.74</b>	AALTONEN	11AI	CDF $p\bar{p}$ at 1.96 TeV

NODE=S086PB6

NODE=S086PB6

 **$B(B_s \rightarrow \phi \ell^+ \ell^-) (1.0 < q^2 < 6.0 \text{ GeV}^2/c^2)$** 

VALUE (units $10^{-7}$ )	DOCUMENT ID	TECN	COMMENT
<b>1.14±0.79±0.36</b>	AALTONEN	11AI	CDF $p\bar{p}$ at 1.96 TeV

NODE=S086PB7

NODE=S086PB7

 **$B(B_s \rightarrow \phi \ell^+ \ell^-) (0.0 < q^2 < 4.3 \text{ GeV}^2/c^2)$** 

VALUE (units $10^{-7}$ )	DOCUMENT ID	TECN	COMMENT
<b>3.30±1.09±1.05</b>	AALTONEN	11AI	CDF $p\bar{p}$ at 1.96 TeV

NODE=S086PB8

NODE=S086PB8

 **$B_s^0$  REFERENCES**

AAIJ	13	NP B867 1	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54596
AAIJ	13A	NP B867 547	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54670
AAIJ	13B	PRL 110 021801	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54767
AAIJ	13L	JHEP 1303 067	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54950
ABAZOV	13	PRL 110 011801	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=54799
ESEN	13	PR D87 031101	S. Esen <i>et al.</i>	(BELLE Collab.)	REFID=54894
AAD	12AE	PL B713 387	G. Aad <i>et al.</i>	(ATLAS Collab.)	REFID=54194
AAD	12CV	JHEP 1212 072	G. Aad <i>et al.</i>	(ATLAS Collab.)	REFID=54785
AAIJ	12	PL B707 349	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=53982
AAIJ	12A	PL B708 55	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54033
AAIJ	12AE	PR D85 112013	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54374
AAIJ	12AG	JHEP 1206 115	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54471
AAIJ	12AM	PR D 109 131801	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54590
AAIJ	12AN	PR D 109 152002	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54591
AAIJ	12AO	PR D86 052006	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54592
AAIJ	12AP	PR D86 071102	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54593
AAIJ	12AR	JHEP 1210 037	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54595
AAIJ	12AX	PR D86 112005	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54765
AAIJ	12B	PL B707 497	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54034

NODE=S086

AAIJ	12D	PRL 108 101803	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54036
AAIJ	12E	PL B708 241	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54043
AAIJ	12F	PL B709 50	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54044
AAIJ	12I	PL B709 177	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54061
AAIJ	12L	EPJ C72 2118	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54136
AAIJ	12O	PL B713 172	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54188
AAIJ	12P	PL B713 369	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54189
AAIJ	12Q	PL B713 378	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54190
AAIJ	12R	PL B716 393	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54191
AAIJ	12S	PRL 108 151801	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54213
AAIJ	12V	PRL 108 201601	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54216
AAIJ	12W	PRL 108 231801	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54217
AALTONEN	12AJ	PRL 109 171802	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=54598
AALTONEN	12C	PRL 108 201801	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=54065
AALTONEN	12D	PR D85 072002	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=54070
AALTONEN	12L	PR 108 211803	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=54241
ABAZOV	12AF	PR D86 092011	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=54702
ABAZOV	12C	PR D85 011103	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=54013
ABAZOV	12D	PR D85 032006	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=54062
CHATRCHYAN	12A	JHEP 1204 033	S. Chatrchyan <i>et al.</i>	(CMS Collab.)	REFID=54060
LEES	12A	PR D85 011101	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=53993
LI	12	PRL 108 181808	J. Li <i>et al.</i>	(BELLE Collab.)	REFID=54116
AAIJ	11	PL B698 115	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=53671
AAIJ	11A	PL B698 14	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=16665
AAIJ	11B	PL B699 330	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=16667
AAIJ	11D	PL B706 32	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=53847
AAIJ	11E	PR D84 092001	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=53856
Also		PR D85 039904 (errat)	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54371
AALTONEN	11A	PR D83 052012	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=53675
AALTONEN	11AB	PR D84 052012	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=53799
AALTONEN	11AG	PRL 107 191801	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=53834
Also		PRL 107 239903 (errat)	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=54005
AALTONEN	11AI	PRL 107 201802	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=53836
AALTONEN	11AN	PRL 107 261802	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=53946
AALTONEN	11AP	PRL 107 272001	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=53983
AALTONEN	11L	PRL 106 161801	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=16443
AALTONEN	11N	PRL 106 181802	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=16447
ABAZOV	11U	PR D84 052007	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=53796
CHATRCHYAN	11T	PRL 107 191802	S. Chatrchyan <i>et al.</i>	(CMS Collab.)	REFID=53839
LI	11	PRL 106 121802	J. Li <i>et al.</i>	(BELLE Collab.)	REFID=53672
ABAZOV	10E	PR D82 012003	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=53317
ABAZOV	10H	PR D82 032001	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=53366
ABAZOV	10S	PL B693 539	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=53481
ESEN	10	PRL 105 201802	S. Esen <i>et al.</i>	(BELLE Collab.)	REFID=53462
LOUVOT	10	PRL 104 231801	R. Louvot <i>et al.</i>	(BELLE Collab.)	REFID=53334
PENG	10	PR D82 072007	C.-C. Peng <i>et al.</i>	(BELLE Collab.)	REFID=53470
AALTONEN	09AQ	PRL 103 191802	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=53063
AALTONEN	09B	PR D79 011104	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=52686
AALTONEN	09C	PRL 103 031801	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=52698
AALTONEN	09P	PRL 102 201801	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=52855
ABAZOV	09E	PRL 102 032001	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=52650
ABAZOV	09G	PRL 102 051801	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=52652
ABAZOV	09I	PRL 102 091801	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=52703
ABAZOV	09Y	PR D79 111102	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=52939
LOUVOT	09	PRL 102 021801	R. Louvot <i>et al.</i>	(BELLE Collab.)	REFID=52646
AALTENEN	08F	PRL 100 021803	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=52227
AALTENEN	08G	PRL 100 161802	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=52228
AALTENEN	08I	PRL 100 101802	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=52233
AALTENEN	08J	PRL 100 121803	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=52234
ABAZOV	08AM	PRL 101 241801	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=52604
WICHT	08A	PRL 100 121801	J. Wicht <i>et al.</i>	(BELLE Collab.)	REFID=52436
ABAZOV	07	PRL 98 121801	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=51664
ABAZOV	07A	PRL 98 151801	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=51673
ABAZOV	07N	PR D76 057101	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=51936
ABAZOV	07Q	PR D76 092001	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=52002
ABAZOV	07Y	PRL 99 241801	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=52091
ABULENCIA	07C	PRL 98 061802	A. Abulencia <i>et al.</i>	(FNAL CDF Collab.)	REFID=51674
DRUTSKOY	07	PRL 98 052001	A. Drutskoy <i>et al.</i>	(BELLE Collab.)	REFID=51621
DRUTSKOY	07A	PR D76 012002	A. Drutskoy <i>et al.</i>	(BELLE Collab.)	REFID=51852
ABAZOV	06B	PRL 97 021802	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=51245
ABAZOV	06G	PR D74 031107	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=51327
ABAZOV	06V	PRL 97 241801	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=51583
ABULENCIA	06J	PRL 96 191801	A. Abulencia <i>et al.</i>	(CDF Collab.)	REFID=51210
ABULENCIA	06N	PRL 96 231801	A. Abulencia <i>et al.</i>	(CDF Collab.)	REFID=51236
ABULENCIA	06Q	PRL 97 062003	A. Abulencia <i>et al.</i>	(CDF Collab.)	REFID=51254
ABULENCIA,A	06D	PRL 97 211802	A. Abulencia <i>et al.</i>	(CDF Collab.)	REFID=51490
ABULENCIA,A	06G	PRL 97 242003	A. Abulencia <i>et al.</i>	(CDF Collab.)	REFID=51584
ACOSTA	06	PRL 96 202001	D. Acosta <i>et al.</i>	(CDF Collab.)	REFID=51231
ABAZOV	05B	PRL 94 042001	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=50492
ABAZOV	05E	PRL 94 071802	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=50575
ABAZOV	05W	PRL 95 171801	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=50929
ABULENCIA	05	PRL 95 221805	A. Abulencia <i>et al.</i>	(CDF Collab.)	REFID=50950
Also		PRL 95 249905 (errat)	A. Abulencia <i>et al.</i>	(CDF Collab.)	REFID=51015
ACOSTA	05	PRL 94 101803	D. Acosta <i>et al.</i>	(CDF Collab.)	REFID=50519
ACOSTA	05J	PRL 95 031801	D. Acosta <i>et al.</i>	(CDF Collab.)	REFID=50685
ABDALLAH	04A	PL B585 63	J. Abdallah <i>et al.</i>	(DELPHI Collab.)	REFID=49834
ABDALLAH	04J	EPJ C35 35	J. Abdallah <i>et al.</i>	(DELPHI Collab.)	REFID=49969
ACOSTA	04D	PRL 93 032001	D. Acosta <i>et al.</i>	(CDF Collab.)	REFID=49995
ABDALLAH	03B	EPJ C28 155	J. Abdallah <i>et al.</i>	(DELPHI Collab.)	REFID=49242
ABE	03	PR D67 012006	K. Abe <i>et al.</i>	(SLD Collab.)	REFID=49203
HEISTER	03E	EPJ C29 143	A. Heister <i>et al.</i>	(ALEPH Collab.)	REFID=49462
ABE	02V	PR D66 032009	K. Abe <i>et al.</i>	(SLD Collab.)	REFID=48907

ACOSTA	02D	PR D65 111101	D. Acosta <i>et al.</i>	(CDF Collab.)	REFID=48798
ACOSTA	02G	PR D66 112002	D. Acosta <i>et al.</i>	(CDF Collab.)	REFID=49132
ABBIENDI	01D	EPJ C19 241	G. Abbiendi <i>et al.</i>	(OPAL Collab.)	REFID=48060
ABE	00C	PR D62 071101	K. Abe <i>et al.</i>	(SLD Collab.)	REFID=47762
ABREU	00Y	EPJ C16 555	P. Abreu <i>et al.</i>	(DELPHI Collab.)	REFID=47784
ABREU,P	00G	EPJ C18 229	P. Abreu <i>et al.</i>	(DELPHI Collab.)	REFID=48030
AFFOLDER	00N	PRL 85 4668	T. Affolder <i>et al.</i>	(CDF Collab.)	REFID=47875
BARATE	00K	PL B486 286	R. Barate <i>et al.</i>	(ALEPH Collab.)	REFID=47721
ABBIENDI	99S	EPJ C11 587	G. Abbiendi <i>et al.</i>	(OPAL Collab.)	REFID=47365
ABE	99D	PR D59 032004	F. Abe <i>et al.</i>	(CDF Collab.)	REFID=46705
ABE	99J	PRL 82 3576	F. Abe <i>et al.</i>	(CDF Collab.)	REFID=47003
BARATE	99J	EPJ C7 553	R. Barate <i>et al.</i>	(ALEPH Collab.)	REFID=47010
Also		EPJ C12 181 (errat)	R. Barate <i>et al.</i>	(ALEPH Collab.)	REFID=47372
ABE	98	PR D57 R3811	F. Abe <i>et al.</i>	(CDF Collab.)	REFID=45879
ABE	98B	PR D57 5382	F. Abe <i>et al.</i>	(CDF Collab.)	REFID=45880
ABE	98V	PR1 81 5742	F. Abe <i>et al.</i>	(CDF Collab.)	REFID=46697
ACCIARRI	98S	PL B438 417	M. Acciarri <i>et al.</i>	(L3 Collab.)	REFID=46503
ACKERSTAFF	98F	EPJ C2 407	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)	REFID=45873
ACKERSTAFF	98G	PL B426 161	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)	REFID=45875
BARATE	98C	EPJ C4 367	R. Barate <i>et al.</i>	(ALEPH Collab.)	REFID=45877
BARATE	98Q	EPJ C4 387	R. Barate <i>et al.</i>	(ALEPH Collab.)	REFID=46146
PDG	98	EPJ C3 1	C. Caso <i>et al.</i>		REFID=45838
ACCIARRI	97B	PL B391 474	M. Acciarri <i>et al.</i>	(L3 Collab.)	REFID=45248
ACCIARRI	97C	PL B391 481	M. Acciarri <i>et al.</i>	(L3 Collab.)	REFID=45249
ACKERSTAFF	97U	ZPHY C76 401	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)	REFID=45786
ACKERSTAFF	97V	ZPHY C76 417	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)	REFID=45787
ADAM	97	PL B414 382	W. Adam <i>et al.</i>	(DELPHI Collab.)	REFID=45799
ABE	96B	PR D53 3496	F. Abe <i>et al.</i>	(CDF Collab.)	REFID=44688
ABE	96L	PRL 76 4675	F. Abe <i>et al.</i>	(CDF Collab.)	REFID=44807
ABE	96N	PRL 77 1945	F. Abe <i>et al.</i>	(CDF Collab.)	REFID=44811
ABE	96Q	PR D54 6596	F. Abe <i>et al.</i>	(CDF Collab.)	REFID=44794
ABREU	96F	ZPHY C71 11	P. Abreu <i>et al.</i>	(DELPHI Collab.)	REFID=44704
ADAM	96D	ZPHY C72 207	W. Adam <i>et al.</i>	(DELPHI Collab.)	REFID=45276
BUSKULIC	96E	ZPHY C69 585	D. Buskulic <i>et al.</i>	(ALEPH Collab.)	REFID=44689
BUSKULIC	96M	PL B377 205	D. Buskulic <i>et al.</i>	(ALEPH Collab.)	REFID=44859
BUSKULIC	96V	PL B384 471	D. Buskulic <i>et al.</i>	(ALEPH Collab.)	REFID=44909
PDG	96	PR D54 1	R. M. Barnett <i>et al.</i>		REFID=44495
ABE	95R	PR1 74 4988	F. Abe <i>et al.</i>	(CDF Collab.)	REFID=44274
ABE	95Z	PRL 75 3068	F. Abe <i>et al.</i>	(CDF Collab.)	REFID=44490
ACCIARRI	95H	PL B363 127	M. Acciarri <i>et al.</i>	(L3 Collab.)	REFID=44544
ACCIARRI	95I	PL B363 137	M. Acciarri <i>et al.</i>	(L3 Collab.)	REFID=44545
AKERS	95G	PL B350 273	R. Akers <i>et al.</i>	(OPAL Collab.)	REFID=44272
AKERS	95J	ZPHY C66 555	R. Akers <i>et al.</i>	(OPAL Collab.)	REFID=44289
BUSKULIC	95J	PL B356 409	D. Buskulic <i>et al.</i>	(ALEPH Collab.)	REFID=44400
BUSKULIC	95O	PL B361 221	D. Buskulic <i>et al.</i>	(ALEPH Collab.)	REFID=44543
ABREU	94D	PL B324 500	P. Abreu <i>et al.</i>	(DELPHI Collab.)	REFID=43729
ABREU	94E	ZPHY C61 407	P. Abreu <i>et al.</i>	(DELPHI Collab.)	REFID=43739
Also		PL B289 199	P. Abreu <i>et al.</i>	(DELPHI Collab.)	REFID=42151
AKERS	94J	PL B337 196	R. Akers <i>et al.</i>	(OPAL Collab.)	REFID=44014
AKERS	94L	PL B337 393	R. Akers <i>et al.</i>	(OPAL Collab.)	REFID=44018
BUSKULIC	94B	PL B322 441	D. Buskulic <i>et al.</i>	(ALEPH Collab.)	REFID=43741
BUSKULIC	94C	PL B322 275	D. Buskulic <i>et al.</i>	(ALEPH Collab.)	REFID=43742
ABE	93F	PRL 71 1685	F. Abe <i>et al.</i>	(CDF Collab.)	REFID=43508
ACTON	93H	PL B312 501	P.D. Acton <i>et al.</i>	(OPAL Collab.)	REFID=43476
BUSKULIC	93G	PL B311 425	D. Buskulic <i>et al.</i>	(ALEPH Collab.)	REFID=43439
ABREU	92M	PL B289 199	P. Abreu <i>et al.</i>	(DELPHI Collab.)	REFID=42151
ACTON	92N	PL B295 357	P.D. Acton <i>et al.</i>	(OPAL Collab.)	REFID=43139
BUSKULIC	92E	PL B294 145	D. Buskulic <i>et al.</i>	(ALEPH Collab.)	REFID=42241
LEE-FRANZINI	90	PRL 65 2947	J. Lee-Franzini <i>et al.</i>	(CUSB II Collab.)	REFID=41398